CHAPTER - 5

ASCERTAINING THE INVESTMENT REQUIREMENT, OPERATIONAL COSTS AND REVENUE OF ALTERNATIVE TECHNOLOGIES.

COSTING OF ALTERNATIVE TECHNOLOGIES

Introduction

In Chapter-4 twelve(12) complete alternative technologies for the production of grey cloth have been established, by combining four (4) stages of production either entirely from the modern or the intermediate technologies, or from a combination of modern, intermediate and traditional technologies. The following Chapter (i.e Ch.-5) has extensively dealt with the type and the number of machinery required to combine these technologies under factory shed or cottage level production. In order to aid economic evaluation , it is now essential to cost these technologies to ascertain the investment requirement of each complete technology. Besides the investment cost, a knowledge of the operating costs of these technologies is prequisite for their appraisal. It is against this background, that this chapter attempts to identify all the cost elements involved in both investment and operating costs, and finally determine the total cost of the twelve (12) alternative technologies. It is to be expected that these costs will vary across the modern, intermediate and traditional technologies. This variation could result from the difference in investment costs, the type of machinery and their sources, location of the production unit, construction structure of the factory or production shed, etc. While the operating costs could vary due to raw-material and other input costs, labour wage-rate, maintenance costs, etc. Tax and duties on alternative sources of machinery and raw-material input also play an important part in this. It has been already discussed in the section on 'Data Requirement and their Related Data Sources', about the nature of information required and the emphasis given on collecting these information to enable costing of the established technologies selected for this study. The costing which follows would first be dealing with the investment costs for the organised sector technologies with alternative sources of machinery, followed by the decentralised and the traditional technologies; and would then deal with the operating costs.

Investment Costs

The total investment cost would be constructed for complete textile processes of the twelve alternative technologies identified in Chapter-4. As these alternative technologies combine pre-spinning spinning, pre-weaving and weaving of modern, intermediate, KVIC and traditional technologies, therefore their costing would have to be on the basis of these four stages of production.These would then combine to form the cost of a complete technology. The total investment cost has been disaggregated as follows :-

- I Land and Land Development Cost
- II Construction and Infrastructural Cost
- III Machinery and Equipment Cost
- IV Other Costs
- V Working Capital.

The total investment costs of the alternative technologies should assimilate all these cost elements. The cost elements I-IV do not involve any operating costs,but in estimating the working capital for each technology information on raw-material, wage , maintenance costs and the selling price of the yarn or the grey cloth are required. Therefore an estimate of the working capital should ideally be attempted after having established the operating costs and the revenue of the technologies. However, in the present case the working capital would be associated with the investment costs although they would be calculated after the establishment of the operating costs. It is to be noted that the construction period i.e from the setting-up to the project until start up time would vary for different technologies. It has been assumed to be three (3) years for modern, two and one years for intermediate and KVIC technologies(See Chapter-4). While as regards the traditional technology, it has been assumed that the looms have already been placed at the cottage level i.e they require no construction time. The progress of the construction work at each year during the commissioning of the mill would also likely to vary for different technologies. Therefore, an estimate of the per centage of accomplishment of the construction of the factory shed, other building and other infra-structures at the end of each year including the time time required for the installation of machinery should be made for the alternative technologies. The total investment costs , as stated earlier, would then follow for modern, intermediate , KVIC and the traditional technologies.

Modern Technology

The total investment costs , as mentioned earlier, would ideally be required to be assessed for the four stages of production. However, careful observation shows that for modern composite unit or modern spinning, the service centre and the traditional weaving, the production stages I and II have been combined with the same source of technology. The only exception is that the ring finishing processes viz. Reeling, Bundle and Bailing press which required for modern spinning to supply yarn to the Service Centre or the Handloom weavers are eliminated when the production takes place within a composite unit. It would therefore be essential to determine the total investment costs for a complete spinning unit producing yarn as an intermediate output. For composite unit,costing would be done separately for the spinning unit, excluding ~~ring-~~finishing sub-processes and the weaving section, and then they would be added up to arrive at the total investment cost of the composite unit. It is to be noted that for the weaving section, the costs of prepratory and Weaving processes (i.e stage III and IV) do not have to be identified separately, as because for the composite unit they are assumed to be from the same source of machinery. As an alternative the modern weaving section have been replaced completely by either Service Centre ~~the~~ traditional pre-weaving and handloom. The costing of the alternative technologies in the modern sector would be done for the complete spinning unit and subsequently for the composite unit with machinery sources from UK, Japan, India and Rumania.

Land and Land Development Costs (Cost Element-I)

When setting up a plant, the land has to be purchased and developed i.e it should be levelled or filled up if it is a low lying land and made ready for construction work to take place. Some of the costs for this is incurred at the very beginning, which involves the purchase of the land and 75 per cent of the development work that has to be done before the project is formally commissioned. In other words, this expenditure has to be made at the beginning of the year- I. The rest 25 per cent land development cost would take place in the second year. This has been assumed from the experiences of the BTMC, where a project has been observed to take as long four(4) to five(5) years to complete. The land requirement for composite spinning and composite unit have been taken to be 16 and 20 acres (i.e 64,670 and 88,920 sq. meters) respectively and the price per acre to be Tk. 47,600. The land requirement and its price per acre and the cost of its development have been assumed to be identical for all sources of modern technologies viz. UK, Rumania, Japan and India. Table 6.1 below gives the total land and land development costs for all the sources of technologies

TABLE 6.1

Land and Land Development Costs of Modern Technology

Sources of Tech.	Prodn.Unit 1/ Stages	Cost of Land (Tk.)	Development Cost (Tk.)	Total Cost (Tk.)
UK/Japan	Spinning (Stage I+II+RF)	764,800	934,980	1,699,780
	Spinning(I+II)	669,150	817,970	1,487,120
	Weaving(III)	382,450	467,440	849,890
	Composite (I to IV)	1,051,600	1,285,410	2,337,010

1/ Types of Units: Complete Spinning Unit (Stages I + II + RF)
Spinning for Composite Unit (Stage I + II)
Weaving for Composite Unit (Stage III + IV)
Composite Unit(Stages I to IV)

The table shows that land and land development comprise 45 and 55 per cent of the total costs. The total land and land development cost for a complete spinning unit which supplies yarn to the Service Centre and the handloom weavers is about Taka 1.7 million. The total cost,of a composite unit which is shown separately for spinning and weaving(composite) in the table adds up to about Taka 2.34 million . These costs as already mentioned are identical for all technology sources and have shown on an annual basis during the construction period of the projects in a detailed form in appendix 6.1 .

Construction and Infra-Structural Costs (Cost Element-II)

While selecting machinery it was discovered that the alternative sources of supply required different floor space area, similarly the nature of construction for alternative technologies have also been found to be varied. For modern technology, the construction would be as mentioned, of concrete foundation with concrete floor and roof and brick walls. The entire construction structure could be decomposed into functional buidldings , which comprises of the factory shed, godown, administrative and other buildings,residential buildings such as quarters for the manager and other administrative and technical staffs and finally, utility and infra-structural facilities like internal roads, surface drains , etc. The total construction costs can also be expresed in the same fashion. These are shown in appendix 6.2. It appears from the appendix that the construction per square meter varies according to the types of factory building as for example the cost for factory shed per square meter is about Taka 2,736, while for the waste cotton godown it is taken as 1,640. It has been mentioned earlier that the total construction period would be spread over three (3) years. Table 6.2 below shows the yearly accomplishments of the total construction work in terms of percentage :-

TABLE 6.2

Percentage of the Yearly Construction Accomplishments

Type of Construction	1st Year	2nd Year	3rd Year	Total
i) Functional Bldg.	20	70	5.0	100
ii) Residential Bldg.	20	20	60.0	100
iii) Utilities	10	30	60.0	100

Table 6.3 shows that in the first year 25 per cent of the functional and 20 per cent of the residential buildings and 10 per-cent of the utility constructions have been accomplished. These costs are assumed to have already been incurred at the beginning of the first year. This can be substantiated from the evidence that in the BTMC new mills, some building construction and infra-structural work take place to provide accomodation for the construc-tion workers and the project management staff even before the project work is begun. Besides, it has been observed that, the cons-truction materials are brought earlier than the taking place of the actual construction work. This is to counteract any regular material supply problem , which is a common feature in Bangladesh. The table shows the total cost of the alternative sources of complete spinn-ing (I+ II) composite(Ito IV) , units.The cost of the composite unit is the sum of the composite spinning(I+II) and weaving(III+IV) unit. these have been shown in table 6.3.

TABLE 6.3

Total Construction Cost of Modern Technologies.
(In Million Taka)

Source of Technology	Spinning (I+II+RF)	Cost Index	Spinning (I+II)	Weaving (III+IV)	Composite (I to IV)	Cost Index
UK	42.20	100	38.09	30.02	68.12	100
JAPAN	41.81	99	37.82	31.10	68.92	101
INDIA	41.30	97.9	37.13	30.66	67.79	99.5
RUMANIA	41.89	99.3	37.47	30.91	68.38	100.4

It is to be noted that , the construction cost for residential buildings, utilities and infra-strúcture have been taken to be identical across all the technology sources. The variation in the construction costs is therefore due to the difference in the functional building especially the factory building area(See appendix 6.2). The total construction cost for each complete spinning and composite unit shows that they vary between 41.3 to 42.2 and 67.79 to 68.92 million respectively. The cost of complete spinning unit for UK,Japanese,Rumanian & Indian technologies are Tk. 422.00 million, Tk. 418.08m, Tk. 413.02m and Tk. 418.93million respectively. And for composite unit of these technologies, they are Tk. 681.07m , Tk. 689.22m, Tk. 677.92 and Tk. 683.80 million respectively. The variation in the construction costs appears to be less significant which is only about 1.6 to 2.1 per cent for spinning and composite units respectively. Taking the UK technology as the base cost, the construction cost index have been calculated for the rest of the technologies. Calculations show that , as regards the spinning unit, the UK has the highest construction cost followed by Rumania, Japan and India. For the composite units, Japan emerges as the technology with the highest construction cost followed by Rumania, UK and India. The Japanese need for high construction cost has been attributed to its use of large number of looms in contrast to other technologies.

Machinery and Equipment Cost (Cost Element-III)

The cost of machinery and equipment have been based on the number of machinery selected for each sub-process. In addition to this , any additional machinery and equipment like the workshop machinery and also the cost of spares have been included in the total machinery requirement. Auxiliary machines such as the Card Grinding, Roller Covering machinery for maintenance , testing equipment for quality control of yarn and cloth, workshop machinery such as lathe, drill, etc have been considered in the total costs and their costs have been assumed to be identical across the technologies. These costs have been estimated from the new mills under the supervision of the BTMC. This has been done so as because it is difficult to get the detailed prices of the auxiliary machinery from the manufacturer who sometimes do not even manufacture these machinery. ~~The cost estimates obtainable from the BTMC are usually for auxiliary machinery which are presently in use~~. Similarly, the cost of air-conditioning plant for the spinning units, humidifiers for the weaving sections and electrical sub-station are taken from the BTMC and have been assumed to/be identical across the technologies. Although,the air-conditioning plant is identical for all spinning units,but the number of humidifiers for the weaving sections varied

as the number of looms varied considerably across the technologies. According the cost for humidification was adjusted across the technologies. It has been found that the total machinery prices quoted by the supplier included two-years' supply of spares and their costs. These spares cost would, therefore, be included in the investment costs, and at the initial period of operation no additional spares cost would be considered .

It has been mentioned earlier that, the machinery prices for UK, and Rumanian sources of technology were not available especially for the sub-processes in preparatory weaving section (stage III) . However, this was not a problem for the Japanese and Indian machinery. To overcome this constraint as discussed already the cone-wind/ing machinery of the UK technology were subsituted by French and the warping, sizing, and pirn-winding machinery by USA supply sources and their machinery prices were used. For Rumanian machinery,/except for Cone-Winding, the warping, sizing and the pirn-winding machinery prices have been estimated by calculating the price co-effecient for all the sources of machinery from the FOB price of the spinning machinery. 2/ Table 6.4 shows the calculated price co-effecient for UK,Japanese, Rumanian and Indian technologies :-

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2/ These prices do not include the cost of the auxiliary machinery, accessories and testing equipments.

TABLE 6.4

Price Co-effecient of Spinning Machinery

Technology Sources	FOB Price (million Tk.)	Co-effecient
UK	113.36	1.412
Japan	103.06	1.284
Rumania	82.00	1.021
India	80.27	1.000

The price co-effecient varies between 1 to 1.41 for Indian and UK technologies. The Rumanian warping, sizing and pirn-winding prices have been estimated by multiplying the Indian prices with the co-effecient 1.021. The prices used for pirn-winding , warping and sizing/for UK technology have been compared with the price co-effecient calculated above. It shows that the relative prices for pirn-winding,sizing and warping machinery from India and UK are 1.41, 1.55 and 1.91 respectively.

The total machinery cost have been divided into two groups: imported and local machinery, equipment and material costs. Imported machinery involves both FOB and CIF costs, while the local machinery shows the ex-factory costs. The freight costs shown for machinery from the UK is 6 per cent of the FOB price, while for the Japanese and the Rumanian it is 5 per cent and for the Indian 4 per cent respectively. The imported machinery and equipment besides their CIF costs, involve 7 per cent import taxes and duties, 2.5 per cent landing charge and transportation to the factory site, 0.5 per cent local agent commission and 2 per cent miscellaneous and other costs. In all, it would require a total of 12 per cent on CIF cost for imported machinery to reach at the factory site. For local machinery, equipment and materials,20 per cent excise duty, 2 per cent transportation cost and 3 per cent miscellaneous and other costs would be required which is a total of 25 per cent on the ex-factory cost at the factory site. All these estimates have been prepared to give the total machinery and equipment cost at the factory site.

The total costs of imported and local machinery, equipment and materials including their taxes and duties, costs of transportation and other costs have been given in appendix 6.3 in terms of foreign and local currency. Table 6.5 below shows the total cost of machinery, equipment and materials for complete Spinning , spinning and weaving for composite and composite technologies from UK, Japan, India and Rumania. All these costs are incurred in the third year of the project life.

TABLE 6.5

Total Machinery and Equipment Cost of Modern Technology
(All in million Taka)

Sources of Technology	Spinning (I+II+RF)	Cost Index	Spinning (I + II)	Weaving (III+IV)	Composite (I to IV)	Cost Index
UK	185.74	100	177.83	204.51	382.34	100
JAPAN	163.64	88.1	155.14	138.57	293.72	76.8
INDIA	127.56	68.7	121.78	146.12	267.90	70.0
RUMANIA	132.30	71.2	125.56	151.92	277.48	72.6

The table shows ~~that the cost of the spinning and the composite unit machinery across the technology sources varies between Tk. 127.56 to Tk. 185.74 and Tk. 267.9 to Tk. 382.34 million respectively~~. The cost of complete spinning units for UK, Japanese, Rumanian and Indian technologies are Tk.185.74m, Tk.163.64m, Tk,127.56m and Tk.132.30 million respectively. And for the composite units of these technologies, they are Tk.382.34m, Tk.293.72m, Tk.267.90m and Tk.277.48 million respectively. Unlike the construction costs, the variations here are quite significant , and are about 31 per cent for spinning and 30 per cent for the composite units. ~~The machinery cost indices with UK as the base technology , shows that for both~~

~~spinning and composite units, the UK has the highest and India the lowest machinery and equipment costs.~~ The costs for spinning and composite unit machinery in the highest to the lowest order are from UK, Japanese, Rumanian and Indian sources. There is very little difference between the cost indices of the spinning and composite units of Indian and Rumanian sources when compared with the UK machinery. For instance, the cost indices of Indian and Rumanian technologies were 68.7 and 71.2 for spinning units respectively, while for the composite units, they were 70 and 72.6 respectively. However, this is not so with the Japanese machinery where the index number for the spinning unit is 88.1 while for the composite unit it is 76.8. [illegible] . This indicates that the Japanese weaving machinery are cheaper than the spinning as compared to UK machinery. This low price is inspite of the use of 100 more looms by the Japanese technology.

Installation and Other Costs (Cost Element V)

The total installation and other costs includes installation expenses, admininstrative and overheads and finally contingency. The installation cost is only to be regarded for imported machinery The local machinery prices include the manufacturer's responsibilit to install them in the factories. The total local machinery cost includes Reeling, workshop machinery and electrical materials for spinning units, while the Reeling machinery is excluded for the composite units. Over 50 per cent of the total local costs comprises of electrical materials which do not require any installation cost. The Reeling and workshop machinery unlike the imported machinery which come in components, are brought to the factory site as complete machinery and hence entail very little installation works. The installation expenses are [illegible] estimated from the new mills currently under construction and is estimated to be 3 per cent CIF cost of the imported machinery. This cost is constituted 80 per cent in local and 20 per cent in foreign currency which is required to be paid to the foreign expertise. Besides installation cost, there is administrative and management overhead expenditures which has been assumed to be identical for spinning and composite units across all the technology sources. This cost comprises of supervision salary during the construction period, plus overheads on these salaries to cover stationery and other costs (See appendix 6.4). Finally a contingency of 5 per cent over total local cost i.e the cost in local currency on land and land development , construction and local cost of machinery and equipment have been included in 'other costs'. The total installation and other costs are spread over a three years period during the construction of the project. The installation cost is being incurred on the 3rd year, while the administrative and overhead costs are spread over three years as shown in the above appendix. The contingencies have also been taken to be spread over a period of three years with 20 per cent expenditures in the first year and 40 per cent during the 2nd and 3rd years.

Table 6.6 shows the total and the other costs incurred by all the alternative sources of technologies.

TABLE 6.6

Total Installation Cost of Modern Technologies
(In Million Taka)

Source of Technology	Spinning (I II RF)	Cost Index	Spinning (I II)	Weaving (III IV)	Composite (I to IV)	Cost Index
UK	10.00	100	9.50	8.51	18.01	100
JAPAN	9.27	92.7	8.76	6.45	15.21	84.5
INDIA	8.08	80.8	7.65	6.67	14.32	79.5
RUMANIA	8.27	2.7	7.79	6.71	14.50	80.5

The table shows that the **total installation costs** ~~varies for spinning and composite units between Tk.8.26 to Tk. 10 and Tk.14.32 to Tk.18.01 million respectively. The cost~~ of complete spinning units for UK, Japanese, Rumanian and Indian technologies are Tk.100.00m , Tk.927.06m , Tk.808.55m and Tk.826.75million respectively. And for the composite units of these technologies, they are Tk.180.11m , Tk.152.11m , Tk.143.21m and Tk.145.03 million respectively. The cost varies almost identically for both the spinning and composite units with 20 per cent variation between the minimum and the maximum costs. The indices calculated with UK as the base technology shows that it(UK) has the highest installation and other costs for both spinning and weaving units while the Indian source has the lowest costs. The ranking of the costs are identical for both spinning and weaving and follows in the order of UK, Japan, Rumania and India.

Working Capital

The importance of working capital is closely dependant on the stocks of raw-material, material in the processing stage, finished goods, stock of spares and accessories and the cash in hand. As has been discussed in Chapter-2 that about 99 per cent of the raw-cotton used are imported. Almost all the textile mcahinery are also imported, therefore , a large proportion of the spares too are externally procured. The raw-cotton and spares stock level would depend on the source of supply. As the sources of supply are outside the country, a high level of stock is desired. The time taken for processing the materials would depend on the effeciency of the machinery, labour productivity and equally importantly on the type of technology applied. The machine with higher speed as for example the modern technology, would require less time for processing than machinery and equipment with lower speed i.e intermediate and the traditional technologies. The processing time should therefore accomodate such factors. The stock level of finished goods would depend on the kind of market for which the product has aimed at and also on the marketing strategy. It is for certain that even with identical products brought about by the modern, intermediate and traditional technologies , the market aimed at by them are different. The nature of the market and the production technology themselve would influence the level of stock of finished goods maintained by the alternative sector of technologies. Finally the cash-in-hand would involve paying the wages and salaries and miscellaneous payments involved. The total working capital , should thereofere, take all these factors into account.

The above parameter have been decided based upon estimates made by three sources, viz.,The Nederland Economic Institute Report on the ' Feasibility of a Textile Promoting Plant in Bangladesh ' 3/ , Pickett and Robsons' study on'The choice of Technology in Cotton Cloth Production ' (1981), 4/, and finally from the BTMC Planning and Development Department. The Nederland report being a country specific study is a very relevant guide although it does not deal specifically with cotton cloth production. Pickett and Robson deal explicitly with the working capital requirements of the developing countries though not with particular reference to Bangladesh, but their work has relevance to cotton cloth production The BTMC on the other hand does not deal with the specific elements that constitute the working capital, but rather assume a fixed lump-sum for the working capital. Table 6.7 below shows the parameter used in estimating the working capital for the spinning and the composite textile units :-

TABLE 6.7

An Estimate of Modern Technology Working Capital Parameters

Items	Time Period
1. Raw-cotton	26 weeks
2. Work in Progress	3 weeks
3. Finished Goods Stock	2 weeks
4. Spare Parts	
a. Imported	26 weeks
b. local	4 weeks
5. Cash in Hand	-1 month's wages for production workers -1 month's salaries for administrative and management staff.

3/ The Choice of Techniques in the Production of Cotton Cloth, by J. Pickett and R.Robson, Scottish Academic Press, Edinburgh, p. 51.

The total working capital estimates have been done for both spinning and the composite units. The need for the working capital arises from the time of the production start-up which begins at the end of the 3rd year. It has been seen that by the end of the 3rd year the production level reached at 12 per cent, 84 per-cent in the 4th year and 100 per cent in the 6th year(See appendix 6.5). In the 3rd year the working capital requirement is 15 per-cent of the total which reaches upto 85 and 100 per cent in the 4th and 5th years respectively. However , in the 6th year , there is a further increase in the working capital require-ment.. This is because the total spares consumption have been assumed to contain 75 per cent imported and 25 per cent local supply. The working capital element for spares only accounts for local spares until the 5th year, while as mentioned earlier the demand for imported spares arises from the 6th year. as because the cost of machinery and equipment include two years' spares supply. In the 6th year, therefore, the total working capital due to the required stock of local as well as imported spares reaches its maximum level. The build-up of the total working capital for the spinning and the composite units with the mentioned details for UK, Japanese, Rumanian and Indian technology sources have been given in the appendix 6.5 . Table 6.8 below gives a summary of the total working capital requirement of all the sources of technology considered in this study.

TABLE 6.8

Total Working Capital Requirement for Modern Technologies
(In Million Taka)

Source of Technology	Spinning (I II RF)	Cost Index	Composite (I to IV)	Cost Index
UK	35.03	100	42.92	100
JAPAN	34.84	99.5	42.23	98.4
INDIA	34.55	98.6	42.01	97.9
RUMANIA	34.61	98.8	42.12	98.1

4/ Feasibility Study for a Textile Finishing Plant in Tongi, Bangladesh, Nederland Economic Institute, 1980, p.70.

The table does not, unlike the previous ones furnish the breakdown of the working capital required for the spinning(I+II) and weaving(III+IV) units to arrive at the sum (total) for the composite units. This was as because the weaving is organised under the same factory shed and the yarn was directly transfered to the weaving section. 5/ The working capital requirement for ~~the spinning and composite units varies between Tk. 34.55m to Tk.35.03m and Tk.42.01m to Tk.42.92 million respectively.~~ complete spinning units for UK, Japanese, Indian and Rumanian technologies are Tk.350.31m, Tk.348.84m, Tk.345.51m and Tk.346.14 million respectively.And for the composite units of these technologies, they are Tk.429.23m, Tk.422.28m, Tk.420.15m and Tk.421.12 million respectivley. The variations are less significant for both the units as compared to other cost elements examined earlier, and are only about 0.5 to 1.6 per cent. The indices indicate that the UK has the largest working capital requirement followed by Japan, Rumania and India.

Total Investment Cost of Modern Technology

The total investment cost for the spinning and the composite units of alternative technology sources viz. UK, Japan, India and Rumania can be obtained by combining the five cost elements already established . These investment costs would be spread over a period of one to six years as discussed earlier. The appendix 6.6 shows all these cost elements on an yearly basis, including their foreign currency component which combines with the total investment costs for the spinning and the composite units for all the sources

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5/ The calculation of the working capital for the weaving section would be required, if the weaving is organised separately as a unit. Such consideration has not been made in this study as production unit of this type is not in operation in Bangladesh, except for specialised textiles under the private sector. However, if the weaving is assumed to be done separately as a unit then the complete spinning unit(I+II+RF) would supply yarn to such weaving unit , the working capital of which has been calculated in table 6.8. Working capital is not required separately for the spinning and weaving units, if the textile production is organised as a composite unit under the same factory shed.

of technology . The total investment cost for all the sources of technologies have been presented in table 6.9 below.

TABLE 6.9

Total Investment Cost of Modern Spinning and Composite Technologies (In Million Taka)

Source of Technology	Spinning (I II RF)	Cost Index	Composite (I to IV)	Cost Index
UK	274.67	100	513.72	100
JAPAN	251.27	91.5	422.42	82.2
INDIA	213.20	77.6	394.37	76.8
RUMANIA	218.78	79.6	404.82	78.8

[illegible] UK incurs the highest investment cost of Tk.274.67 million for spinning followed by the Japanese and the Rumanian technologies of Tk.251.21m and Tk.218.78 million respectively. The Indian technology has the lowest investment cost for spinning units if Tk.213.20 million. This shows that the investment requirement bythe alternative technology sources decreases from UK to Japan, Rumania and India by 9.5, 21.4 and 22.4 per cent respectively. For composite units, the investment cost ranking is identical with UK having the highest cost of Tk.513.72m followed by Japan, Rumania and India of Tk.422.42m, Tk,404.82m and Tk.394.37 million respectively. The corresponding fall in the investment requirements are 17.8, 21.2 and 23.2 per cen[illegible] respectively. The comparative fall in the investment requirements between the spinning and the composite units for Rumanian and India[illegible] technologies are almost identical, while for the Japanese technolog[illegible] the fall for the composite unit of 8.3 per cent is quite significant. The cost indices for the spinning and the composite units reflect these findings.

INTERMEDIATE (SERVICE CENTRE, ATDA, KVIC) TECHNOLOGIES

The alternative technologies established in Chapter-4 which combines four stages of production either with one or all the stages of intermediate technology have been identifies as the Service Centre, RFC, ATDA and KVIC technologies. Among them, the Service Centre(Stage-III) substitutes the preparatory handloom weaving, while the RFC could be either a spinning or a composite unit , which combines power spinning and pedal or power loom. The ATDA (Stage-I) only supplies 'Roving' to the pedal spinners(Stage-II + RF) and combines to form a complete spinning technology . The KVIC is a complete spinning technology by itself, and supplies yarn to the handloom weavers. The investment cost required [illegible] for 3 Service Centres, 20 RFC and ATDA units and 240 KVIC units to arrive at comparable scale of output(Q) would be established in this section. It is possible to combine all the four stages of production as shown in table 4.1 to obtain the total investment cost for the complete technology. As, only the RFC power spinning and pedal or power loom combines to form a complete process with intermediate technology, this section would attempt to establish the total investment cost for this technology only. The total investment costs of the Service Centre, the ATDA and KVIC would be determined after the handloom technology has been costed. The investment cost as before would contain five (5) cost elements.

[illegible] They would be spread over two years except for the working capital which would be spread between year 3 to 6. . The reason for this would be assigned later.

Land and Land Development Costs (Cost Element - I)

The total investment cost constitutes 15 and 55 per cent for land and its development respectively. It has been assumed that this cost would be incurred at the beginning of year-I in the comparative modern and intermediate technology life span. As these production units are situtated near the handloom concentrated areas the cost of land per acre would be less than the modern technology. It has been considered to be 50 per cent of the modern sector. The land requirement per factory unit has been assumed to be 3, 0.5, 2.5 and 0.5 acres for Service Centre, Central opening and Cleaning (Blow-Room), spinning and KVIC units. For ATDA, RFC pedal and power loom composite unit , it has been assumed to be 1.5, 3.0 and 2.5 respectively. It is to be noted that the four(4) central Blow-Room units are attached to four (4) of the 20 spinning units and therefore their land cost would be common to the 20 units when calculating the total land and land development cost (See table 6.10 below). For the ATDA unit, the pedal spinning operates at the cottage level and since it occupies some space , land cost has been considered for it. The land cost for pedal charka is taken to be 75 per cent of the cost used for the intermediate factory unit. As the pedal charkas would be located under some kind of working shed within the household they do not entail any land development cost. The details of land and land development costs for the stages of technologies mentioned are given in appendix 6.7 , the table below furnishes the summary of the total costs.

TABLE 6.10

Land and Land Development Cost of Intermediate Technology
(In Million Taka)

Types of Unit	Unit Cost	No.of Unit	Total Cost
Service Centre(III)	0.18	3	0.54
ATDA and RFC Techs			
a Blow-Room	0.03	4	0.12
ATDA			
b Pre-Spinning(I)	0.09	20	1.80
c Pedal Spinning(II RF)	0.50	20	1.00
ATDA Pedal Spinning(a+b+c)	0.146	20	2.92
RFC			
d Spinning(I+II)	0.12	20	2.40
e Spinning(I+II RF)	0.12	20	2.40
RFC Power Spinning(a + e)	0.126	20	2.52
RFC Weaving			
f Pedal Loom (III+ IV)	0.06	20	1.20
g Power Loom (III + IV)	0.03	20	0.60
RFC Composite Unit			
With Pedal Loom(a d f)	0.186	20	3.72
with Power Loom(a d g)	0.156	20	3.12
KVIC Hand Spinnig(I II RF)	0.030	240	7.20

From the above total land and land development costs, meaningful comparisons with the modern spinning and composite technologies could be made with the costs of ATDA (a+b+c) , and RFC spinning (a+e) and RFC composite units (a+d+f) and (a+d+g). The table shows that the land and land development cost of ATDA and RFC spinning is 72 and 48 per cent respectively higher than the modern spinning unit, while the pedal and the power loom composite units incurs more cost than the modern composite units by 59 and 33.5 per cent respectivley. These increase in investment costs are inspite of taking the land cost to be 50 per cent less for the decentralised compared to the organised sector.

Construction and Utilites Costs (Cost Element - II)

It has been mentioned that the factory and other buildings under the decentralised sector would be of concrete floor, brick wall and tin roof which are quite different from those of the organised sector. This would certainly reduce the construction cost of the decentralised sector per square meter. The construction cost has been estimated from the information provided by the Engineering University and the BTMC, Bangladesh. The estimated cost per square meter has been assumed to be Tk.1,824 and is the same for factory and residential buildings. The total construction cost is composed of factory, residential buildings and utilities, which have been shown in this order in appendix 6.8 . As the commissioning of the project would take two years the construction would also be spread over two rather than three years as in the organised sector. The yearly accomplishment of construction of the total work in terms of percentage has been assumed to be as given in table 6.11 below :-

TABLE 6.11

Percentage of the Total Construction Accomplished Each Year

Type of Construction	First Year (%)	Second Year (%)	Third Year (%)
i) Factory Building	-	60	40
ii) Residential Bldg.	-	20	80
iii) Utilities	-	10	90

When comparaing the life span of the project between modern and intermediate technologies, it appears from the table that unlike the organised the decentralised sector incurred no construction cost in the first year. It would be assumed that there would be some construction work at the end of the first year but its cost would be combined with those of the second year, and all the construction cost would be considered as incurred at the beginning of the second year.

. The total construction costs for the Service Centre, RFC, ATDA and the KVIC factory units have been given in table 6.12 for single units as well as for the total required to meet the comparable level of output.

TABLE 6.12

Total Construction Cost of Intermediate Technologies
(In Million Taka)

Types of Unit	Unit Cost	No.of Units	Total Cost
Service Centre(III)	2.35	3	7.06
ATDA and RFC Techs			
a Blow-Room	0.345	4	1.38
ATDA			
b Pre-Spinning(I)	1.43	20	28.55
c Pedal Spinning(II RF)	0.55	20	11.05
ATDA Pedal Spinning(a b c)	2.05	20	40.98
RFC			
d Spinning(I II)	2.43	20	40.69
e Spinning(I II RF)	2.53	20	50.69
RFC Power Spinning(a e)	2.60		52.07
RFC Weaving			
f. Pedal Loom(III IV)	8.05	20	161.02
g. Power Loom(III IV)	2.63	20	52.55
RFC Composite Unit			
With Pedal Loom(a d f)	10.55	20	211.09
With Power Loom(a d g)	5.13	20	102.62
KVIC Hand Spinning(I II RF)	0.86	240	206.60

It is to be noted that the construction cost for pedal spinning at the cottage level has been assumed for houses with straw and bamboo walls , mud floors and tin roofs. The cost for these have been taken to be Tk.550 per square meter i.e about 30 per cent of the decentralised factory sheds. The construction cost of the ATDA and the RFC units are about 8 to 10 and 37 to 40 per cent higher than Indian, Rumanian, Japanese and UK technologies respectively. For composite units with pedal and power looms, it is between 306 to 311 and 149 to 151 per cent higher for all these technology sources respectively , although the construction cost per square meter for the decentralised is only two-thirds of the organised sector.

Machinery and Equipment Costs (Cost Element - III)

The machinery and equipment cost has been based on the machinery selected for the Service Centre, RFC, ATDA and the KVIC technologies , earlier. In addition to these, auxiliary and testing equipment, workshop machinery and spares for two years have also been included. The four (4) central Blow-Room units supplying 'laps' to 20 spinnning units would accomodate central workshop facilities for major repair work, inspite of small workshop facilities that each unit will have. The machine unit prices for the Service Centre, RFC and the ATDA are identical for most of the machinery, as all the technologies used almost the same machinery. For RFC and the ATDA units, the machinery employed upto the Roving sub-process were identical although the former uses power while the latter pedal spinning. Similarly between the RFC and the Service Centre, identical preparatory machinery are used by both the technologies except that the Service Centre has an extra sub-process where the warp is transfered from a larger beam to the handloom beam. The machinery for this operation is locally manufactured. For composite unit, both the pedal and power looms are also locally manufactured.

As regards the organised sector, the entire machinery cost have been sub-divided into two categories :(i) Imported and,(ii) local machinery, Equipment and material costs. For imported machinery, the freight cost of 4 per cent on FOB is assumed for RFC, ATDA and KVIC technologies, while 5 per cent for the Service Centre because of the large volume of its sizing machinery. An additional11.5 per cent is imposed on the CIF price for the transportation of machinery and equipment to the factory site. This assumes that taxes and duties, landing and transportation and miscellaneous costs are identical , but excludes 0.5 per cent for the local agent. Although the decentralised production units are locate near the handloom concentrated areas and may have less acessibility, inspite of it their landing and transportation costs have been assumed to be identical with those of the organised sector. It has been argued that the decentralised sector would benefit from local means of transportation as they are relatively cheap. For local machinery, equipment and materials an additional 25 per cent on ex-factory cost as for the organised sector has been considered at the factory site. This cost would be incurred at the beginning of the third year when all the equipment and material have been brought to the factory site for installation. The costs of machinery, equipment and materials for the Central Blow-Room with the workshop, Service Centre, RFC, ATDA and the KVIC technologies including the duties and txes, landing and transportation charges and other costs have been given in the appendix 6.9 . The table 6.13 sums up these costs for alternative technology sources.

As the machinery used for intermediate technology are mostly re-built , they would not have the same life expectancy as those of the modern technology. It emerges from the consultation with the machine manufacturer as well as from observations of these technologies that a modernisation of the different sub-processes especially the drafting system of the Roving and the spinning frame would be required if the machine-life has to be assumed as identical to modern machinery. It is believed that such modernisation would be needed in the 14 th year of the project-life. The cost of which would be based on the current price.
It has been observed that the price of intermediate technology has escalated between 2 to 3 per cent in the last 5 years, although the price of some machinery , the ATDA charka for instance has remained unchanged during the same period. It has been estimated that the modernisation would cost at the present time at least 50 per cent of the total CIF or ex-factory cost. It is assumed that the machinery prices increase at the rate of 3 per cent per annum, then a compound increase of 75 per cent at current prices on CIF or ex-factory cost of machinery would be needed for the modernisation at the 14th year. If this modernisation cost is added to the

TABLE 6.13

Total Machinery and Equipment Cost of Intermediate Technology
(In Million Taka)

Type of Unit	Unit Cost	No.of Unit	Total Cost	Modernisation Cost Per Unit	Modernisation Cost Total	Total Comulative Costs
Service Centre(III)	1.69	3	5.07	1.15	3.45	8.51
ATDA and RFC Techs						
a. Blow-Room	1.07	4	4.28	0.71	2.84	7.12
ATDA						
b. Pre-Spinning(I)	1.45	20	28.98	1.10	21.95	50.94
c. Pedal Spinning(II+RF)	3.91	20	78.30	2.50	49.99	128.29
ATDA Pedal Spinning(a+b+c)	5.36	20	111.56	3.74	74.79	186.35
RFC						
d Spinning(I+II)	4.12	20	82.39	2.75	54.96	137.35
e Spinning(I+II+RF)	4.33	20	86.62	2.89	57.79	144.41
RFC Power Spinning(a+e)	4.55	20	90.91	3.03	60.63	151.54
RFC Weaving						
f Pedal Loom(III+IV)	5.37	20	107.49	3.22	64.46	171.95
g Power Loom(III+IV)	4.06	20	81.14	2.43	48.65	129.80
RFC Composite Unit						
With Pedal Loom(a+d+f)	9.71	20	194.16	6.11	122.26	316.43
With Power Loom(a+d+g)	8.39	20	167.82	5.32	106.45	274.27
KVIC Hand Spinning(I+II+RF)	0.51	240	122.97	0.37	90.15	213.12

total cost then the cumulative cost of machinery and equipment for a twenty year project-li e comparable to modern technology would be arrived at.

The initial cost of the Service Centre, ATDA pedal, RFC power and the KVIC hand-spinning are Tk.5.07m, Tk.111.56m, Tk.90.91m and Tk.122.97 million respectively. While the cumulative costs are correspondingly Tk.8.51m, Tk.186.35m, Tk.151.54m and Tk.213.12 million respectively. The table shows that the cumulative costs of the ATDA pedal and the K hand-spinning are about 22.9 and 40.6 per cent more than the RFC power unit respectively. If the cost of the intermediate technology is compared with the modern spinning technology, it appears that the ATDA and the KVIC spinning equipments would require an increase in costs between 0.33 to 46 and 15 to 67 per cent than the UK, Japanese, Rumanian and the Indian spinning technologies. However, the increase in costs for the RFC power spinning is about 14.5 and 18.8 per cent more than the Rumanian and the Indian technologies, while for the Japanese and the UK technologies it falls by about 7.4 and 18.4 per cent respectively. The initial cost of the composite RFC pedal and power loom machinery are Tk.194.16m and Tk.167.82 million , while the total cumulative costs are Tk.316.43m and Tk.274.27 million respectively. The pedal loom requires Tk.42.16 million more ,i.e an increase of 15.4 per cent over the power loom composite unit. However, in compared to modern composite technologies, the cost of the pedal loom entails an increase of between 1.8 and 7.7 per cent over the Japanese, Rumanian and the Indian technologies. The power loom cost increases by only 2.4 per cent over the Indian technology, while for the Rumanian, Japanese and the UK it falls by 1.2, 7.1 and 39.4 per cent respectively. It emerges that the KVIC hand-spinning and the UK composite weaving require the highest total machinery and equipment cost among the modern and the intermediate technologies.

Installation and Other Costs (Cost Element - IV)

Total installation and other costs comprises of installation expenses, administrative overhead and contingencies. Unlike the organised sector, the installation expenses of the intermediate technology involve both imported and local machinery as because many of the machinery such as the pedal and the power looms are locally manufactured. The installation expenses for the Service Centre, Blow-Room and the RFC power spinning units, where almost the entire machinery are imported is taken to be 3 per cent of CIF cost. The installation cost for the ATDA pre-spinning is taken to be identical to the RFC spinning i.e 3 per cent, while for the ATDA Pedal Charka it is taken to be 1 per cent of the CIF costs. The installation expenses of the KVIC spinning is also taken to be 1 per cent of the CIF costs also. The pedal and Ambar Charka frames come as single units which need no foundation work for installation and this explains the low installation expenses required by them. However, the pre-spinning machinery upto ' Drawing' for Ambar spinning require some installation work which could be accomodated within the 1 per cent installation cost assumed for it. The RFC composite unit with pedal or power loom involves installation expenses of 3 per cent on CIF and ex-factory costs for composite spinning and weaving.

It is to be noted that unlike the organised sector, the decentralised technology is entirely installed by local expertise, therefore its installation cost are also in the local currency. The administrative overhead and contingencies have been assumed as identical to the organised sector i.e 10 per cent of the adminstrative salary as adminstrative overhead, while the contingencies have been taken as 5 per cent of local costs incurred in local currency for cost element I to IV. (See appendix 6.10).

The total installation and other costs are spread over two years' period during the construction of the project. The entire installation cost is being incurred in the year 3, while the administrative overhead are spreadovover two years period (See appendix 6.10). The contingencies are taken to be 50 per cent in each year for the two years. The table 6.14 shows the total installation and other costs for the Service Centre, ATDA pedal, RFC power and the KIVC spinning and RFC composite unit with pedal and power loom weaving.

TABLE 6.14

Total Installation and Other Costs of Intermediate Technologies
(In Million Taka)

Types of Unit	Unit Cost	No. of Unit	Total Cost
Service Centre(III)	0.29	3	0.87
ATDA and RFC Techs			
a Blow-Room	0.05	4	0.20
ATDA			
b Pre-Spinning(I)	0.21	20	4.15
c Pedal Spinning(II RF)	0.037	20	0.75
ATDA Pedal Spinning(a b c)	0.255	20	5.11
RFC			
d Spinning (I II)	0.26	20	5.21
e Spinning(I II RF)	0.36	20	7.26
RFC Power Spinning(a e)	0.37	20	7.46
RFC Weaving			
f Pedal Loom(III IV)	0.89	20	17.89
g Power Loom(III IV)	0.54	20	10.86
RFC Composite Unit			
With Pedal Loom(a d f)	1.16	20	23.30
With Power Loom(a d g)	0.81	20	16.27
KVIC Hand Spinning(I II RF)	0.80	240	19.18

The installation and other costs for the ATDA Pedal, RFC Power and the KVIC hand spinning are Tk.5.11m Tk.7.46m and Tk.19.18 million respectively. The KVIC spinning requires Tk.14.07 and Tk.11.72 million more than the ATDA and the RFC spinning, which is an increase in cost of about 375 and 257 per cent respectively. A comparison of the installation and other costs of the modern and intermediate technologies indicate that the expenses for the ATDA Pedal and RFC ..e Power Spinning decreases by 50 to 86 and 2.5 to 27.3 per cent than Indian , Rumanian , Japanese and UK technologies. The KVIC spinning , however experiences an increase in the costs between 202 to 250 per cent than all the modern technologies. The total installation and other costs for the RFC pedal and power composite units are Tk.23.3 and Tk.16.27 million respectively i.e an increase of Tk.7.03 million or 39.5 per cent for the pedal loom. The increase in the installation costs of the pedal loom composite unit has been between 29.40 to 62.75 per cent more than all the modern composite units, while for the power loom composite units it is between 7 to 13.61 per cent more than the Indian, Rumanian and the Japanese composite units and 9.03 per cent less than the UK. It emerges that the installation costs of the KVIC spinning is higher than all the modern and intermediate technologies , while for composite unit it is the UK technology.

Working Capital (Cost Element - V)

[illegible] The estimate for the organised sector [illegible] would be employed here to calculate the working capital for the intermediate technology. However, the parameter used for the modern technology would be slightly modified. The stock for raw- cotton and finished goods are assumed to be identical to the modern technology, while the material in progress is reduced from 3 to 2 weeks for ATDA pre-spinning , RFC power-spinning and composite weaving and 1 week for pedal and KVIC spinning. The subsequent reduction in the processing time has been based on the pre-supposition that the smaller production units would require less time as they would be processing smaller volume of material. Observation of the ATDA and the RFC units reveal that this time could vary between 7 to 10 days, and 3 to 4 days for KVIC spinning.

The spares for intermediate technology would be to be supplied entirely from local sources, therefore the spares stock level is taken to be upto 4 weeks as for local spares in the organised sector. The cash-in-hand for the administrative staff is taken to be same as for the modern sector i.e one month, while as opposed to this, it is only one week for the production workers. The wages in the decentralised sector would paid on a weekly basis , while in the organised sector it would be monthly. The build-up of intermediate sector working capital is assumed to be the same as in the modern sector i.e 15 per cent in start-up time (which is the 3rd year), while in the 4th and the 5th years it increases to the level fof 85 and 100 per cent respectively. The working capital is spread over 3 to 6 years i.e beyond the 5th year. This is because as in the modern sector, the initial stock of two years would be exhausted in the 5th year and in the 6th year the spares component would be added to the working capital. The appendix 6.5 shows the details of the working capital components on an yearly basis for the ATDA pedal , RFC power and KVIC Ambar spinning and RFC pedal and power composite units. The table 4.16 provides a summary of the total working capital requirements of these technologies.

TABLE 4.16

Total Working Capital of Intermediate Technologies

Type of Unit	W.C/Unit	No.of Unit	Total W.C
Service Centre(III)	6.17	3	18.50
ATDA Pedal Spinning(I II RF)	1.51	20	30.17
RFC Power Spinning(I II RF)	1.57	20	31.38
RFC Composite Unit			
With Pedal Loom(I to IV)	1.91	20	38.23
With Power Loom(I to IV)	1.87	20	37.44
KVIC Hand Spinning(I II RF)	0.13	240	31.82

The total working capital has been calculated for the Service Centre, ATDA Pedal RFC power and the KVIC Ambar spinning which supply yarn to the handloom weavers; and for the composite units with pedal and power looms where the yarn is directly transferred to the weaving section.

The working capital requirement for the Service Centre which buys yarn as input is Tk.18.5 million. The spinning and the composite un its which uses cotton as the raw-material shows that the working capital required by the ATDA, RFC and the KVIC spinning are Tk.30.17million, Tk.31.38 million and Tk.37.44 million respectively. The difference in the working capital requirement between spinning and the composite weaving technologies is of little significanee and is 3.4 per cent. However this difference is higher than for modern technology. Among spinning and the composite units, pedal spinning and power looms require the lowest working capital for all the alternative intermediate technologies.

Total Investment Cost of Intermediate Technologies

The total investment cost of the Service Centre, ATDA pedal, RFC power, KVIC Ambar spinning and the RFC composite pedal and power spinning are determined by adding up all their cost elements. These investment costs and their build-up during the construction period have been shown in appendix 6.11. Table 4.17 also/ shows the total cost of single as well as all the units required to meet the comparable scale of output(Q).

TABLE 4.17

Total Investment Costs of Intermediate Technologies
(In Million Taka)

Type of Unit	Unit Costs	No.of Unit	Total Costs
Service Centre(III)	11.83	3	35.48
ATDA Pedal Spinning(I II RF)	13.28	20	265.53
RFC Power Spinning(I II RF)	12.25	20	244.98
RFC Composite Unit			
With Pedal Loom(I to IV)	29.64	20	592.77
With Power Loom(I to IV)	21.69	20	433.73
KVIC Hand Spinning	1.99	240	477.93

The total cost of the Service Centre which replaces the preparatory weaving of the handloom technology is Tk.35.48 million, while for the ATDA pedal, RFC power and KVIC hand-spinning it is Tk.265.53m, Tk.244.98m, and Tk.477.93 million respectively. The KVIC spinning requires Tk.212.4m and Tk.232.95 million more investable fund than the ATDA and the RFC spinning which is an increase in investment cost by 180 and 195 per cent respectively. In compared to the investment cost for the modern spinning, the KVIC requires between 74 to 224 per cent more investable fund than the UK, Japanese , Rumanian and Indian technologies. On the other hand,the investment cost of the ATDA pedal spinning increases between 5.68 to 24.55 per cent than the Indian, Rumanian and the Japanese technologies while it falls by 3.45 per cent in compared to the UK technology.The investment cost for the RFC power spinning also rises and it is about 11.98 and 14.90 per cent more than the

Rumanian and the Indian technologies, and the cost decreases by 2.57 and 12.12 per cent than the Japanese and the UK technologies respectively. The RFC pedal and power composite units cost Tk.592.77 million and Tk.433.73 million respectivley. The pedal loom comnosite unit requires Tk.159.04 Tk.159.04 million i.e 36.67 per cent more investable fund than the power loom weaving.In compared to the investment costs for the modern composite weaving , it is an increase from 15.4 to 50.31 per cent more than the UK, Japanese, Rumanian and the Indian technologies. Although the cost for the composite powerloom falls by 15.57 per cent than the UK technology, but in compared to the Japanese, Rumanian and the Indian composite technologies it has increased by 2.68, 7.14 and 9.98 per cent respectively. It emerges, therefore, that the KVIC spinning and the RFC composite unit with pedal loom require the highest investable funds among all the modern intermediate technologies.

COSTING OF TRADITIONAL TECHNOLOGIES

The traditional handloom of the type viz. Pit and Semi-automatic (C.R) looms would be combined with modern, intermediate and KVIC spinning technologies. It is to be noted that the preparatory weaving for both kinds of looms are identical, and it is only that the types of looms differ when combined as weaving technology. Furthermore, Pit and Semi-automatic looms would be directly combined with the Service Centre as it replaces the preparatory weaving process by supplying warp-beam , however, Nali making/(Pirn winding) would still have to be carried out at the cottage level. The total investment cost required for handloom would be determined for the machinery and equipment selected in table 5.26 . It has been mentioned that these equipment and looms selected,would be able to deliver the comparable scale of output (Q) attained by a modern composite unit. The investment cost would contain five (5) cost elements similar to modern and intermediate technologies.

It would be assumed that ,at the cottage level a comparable number of Pit and C,R looms would be installed which would render the comparable scale of output . These looms would be installed in the 3rd year of the comparative time scalewith other technologies.

Land Costs (Cost Element - I)

The land requirement has been estimated from the loom-shed and the utility area required for pre-weaving and weaving. The loom-shed area needed has been based on the floor space required per loom, while the utility area is considered as 10 per cent more thanthe loom-shed area. Accordingly the land required for Pit and C.R looms have been found to be 23 and 25 acres respectively. The cost of land has been estimated to be Tk.20 thousand per acre. Table 4.18 below shows the land cost of Pit and C.R loom.

TABLE 4.18

The Land Cost for Traditional Technologies (In Taka)

Loom Type	Land Requirement	Total Cost
Pit loom Stage(II + III)	23 Acres	460,000
C.R loom Stage(II + III)	25 Acres	500,000

The land cost for pit and C.R loom weaving are Tk. 460,000 and Tk.500,000 respectively. There is no land development cost involved as these looms are usually placed in a loom-shed wihtin the household area.

Construction Cost (Cost Element - II)

The construction cost for the traditional pit and C.R looms have been based on the observation made during the survey. The type of construction for pit and C.R looms are not similar. Pit looms are housed in a mud floor sheds as they have to be firmly dug into the ground. It has been found that pit looms are characteristically placed in a less costly thatched sheds. While the C.R or the Semi-automatic looms are located in a relatively better shed usually with tin roof. Based on these personal observations, it has been assumed that the loom-sheds for pitloom would have mud floor with thatched roof and bamboo walls. On the other hand, the thatched roof would be replaced by tin for the C.R loom-shed. The construction costs have been estimated to be Tk.365 and Tk.550 per square meter for Pit and C.R looms respectively.

The production period for the alternative technologies had been assumed to be 20 years, therefore, the loom-shed should also have identical life-span. But ,it has been observed that the pit and C.R loom-sheds do not have the same life-span. The survey establishes that they require two and three replacements respectively during a period of 20 years project life. It was found that these costs have escalated at the rate of 3 to 4 per cent annually. The replacement cost of loom and utility sheds have been estimated at current prices taking into consideration an increase in cost of 4 per cent per annum.

The pit loom-shed would be replaced in the 11th and the 18th year, while, the C,R loom-shed in the 14th year . The replacement cost at current prices for pit loom would be 155 and 200 per cent respectively,the corresponding cost for the C.R looms is 75 per cent Accordingly, the construction required for Pit and C.R looms have been calculated and given in table 4.19 :-

TABLE 4.19

Construction Cost of Traditional Technologies
(in Taka)

Type of Technologies	Year of Constructn./Replacmnt.	Total Cost	Total Cumulative Cost
Pit Loom	3	30.03	30.03
(Stage III + IV)	11	46.55	76.58
	18	60.06	136.65
C.R Loom	3	49.06	49.06
(Stage III + IV)	18	85.85	134.92

The total construction costs entailed by Pit and C.R looms are Tk.30.03 million and Tk.49.06 million respectively. While the total construction costs at current prices during life-span of the project for these two looms are Tk.136.65 million and Tk.134.92 million respectivley. Thes costs could be compared with the costs required by the modern and intermediate technologies. The construction costs involved for Pit and C.R looms are between 439 to 455 and 434 to 450 per cent higher than the modern technolgoies of Japan, Rumania, India and UK respectivley. This is inspite of the cheaper construction cost of 13.34 and 20.0 per cent per sq.meter than the modern weaving technologies by the Pit and the C.R looms respectively. In compared to intermediate technology, the construction cost of Pit and C.R looms are about 84.9 and 83.9 per cent of the pedal loom, while correspondingly they are 256.7 ato 260 per cent higher than power loom . This again is inspite of Pit and C.R looms requirement of cheaper construction cost of 20 to 30 per cent per sq.meter of the intermediate technology. The construction costs required by the pedal loom weaving appears to be higher than all the weaving technologies.

Loom and Equipment Costs (Cost Element - III)

The cost of preparatory weaving equipments and looms has been based on their number given in table 5.26. The preparatory machinery cost would be common to both the loom types. In addition to these costs , costs for sizing equipments and spares and accessories for one year would be regarded. The accessories required are shuttle,mera (picker) , spool for bobbin, etc.the cost of which are estimated to be about 6.5 per cent of the total loom and equipment costs for both types of looms. Unlike the modern and intermediate technologies, the equipment and looms are all manufactured by local carpenters, tinsmiths and workshops to meet the domestic demands. The equipment and looms cost do not therefore include any taxes or duties or any other costs. They may requiresome transportation costs , but, that too would be very little. Moreover, the looms and equipment virtually require very little installation expenses as the weavers themselves know how to install and dismantle these looms.

As the Pit and the C.R looms have relatively shorter life-span than the modern and intermediate technologies and even among themselves they do not share identical life, they need to be replaced several times for a comparable project life. It has been estimated that in the life of machine(See Chapter - 4) that Pit and C.R loom had required 3 and 1 replacements in the project life of 20 years. It would be relevant to mention here that the C.R looms cost 3.34 times more than the Pit looms. The replacement costs of the equipment and looms would be estimated at the current prices. The Pit loom would be replaced at the 9th, 14th and 19th years, while the C.R looms at the 14 th year during the comparative time-span of modern, intermediate technologies. The price of loom likewise the construction cost, is less inflationory and their increase in costs has found to be identical. The survey conducted on 214 cottage weavers establihes that , the loom price has risen at the rate of 2 to 3 per cent per annum, and moreover, it varies depending on the type of Pit and C.R looms and the location of production unit. It has been found, for example, in an area of Bangladesh that the loom cost had increased only by a total of 25 per cent in the last 10 years. It has been assumed that the loom cost would increase by 3 per cent annually for both Pit and C.R looms. Accordingly, the compound rate of increase i n 9th, 14th and 19th years would be about 140, 175 and 210 per cent respectively. The total equipment and loom costs are initially taken to be incurred at the beginning of the year 3, then the subsequent replacement costs are added to this costs to establish the cumulative costs for equipment and looms. Table 4.20

both total and the cumulative costs of Pit and C.R loom technologies :-

TABLE 4.20

Total Cost of Equipments and Looms for Traditional Technologies
(In Million Taka)

Type of Technologies	Year of Installa-tion/Replacement	Total Cost	Total Cumu-lative Cost
Pit Loom	3	15.77	15.77
(Stage II + III)	9	22.08	37.85
	14	27.60	65.44
	19	33.11	98.56
C.R Loom	3	36.50	36.50
	9	3·34	39·84
(Stage II + III)	14	63.88	100.38 103·72
	19	5·01	[illegible]

The table shows that the initial and cumulative costs for preparatory equipment for Pitlooms are Tk.15.77 million and Tk.98.55 million and for C.R looms are Tk. 36.50 and Tk.100.37 million respectively. Although the initial cost differential between Pit and C.R looms is Tk.43.20 million, but the cumulative cost differential has decreased to about 2 per cent. This is because of a relatively large replacement entailed by the Pitloom for an identical period. If the handloom weaving cost be compared with the costs of the modern and intermediate technologies , it would appear that the costs of Pit and C.R looms alongwith preparatory equipment costs are between 48.20 to 67.45 and 49.10 to 68.70 per cent of UK, Japanese, Rumanian and Indian weaving technologies. As regards intermediate (RFC) pedal and power looms, they require about 57.31 and 58.37 per cent of pedal and, 75.93 and 77.33 per cent of power looms for machinery and equipment costs. This indicates that for an identical production period even with several replacements of

Pit and C.R looms, the total equipment and handloom cost are only between 50 to 75 per cent of all modern and intermediate weaving technologies.

Installation and Other Costs (Cost Element- IV)

As already mentioned that the traditional handloom weaving require very little transportation or installation cost. It has also been observed that at times the local carpenters or the tinsmiths come to wthe weavers' dwelling place to built these looms. Under such circumstances local artisans are provided with meals. It has been estimated that such cost involvement and other costs would add upto 1 per cent of the total cost of equipments and looms and would be the same for both Pit and C.R looms. The table 4.21 furnishes the total and the total cumulative costs for installation and other costs required by Pit and C.R looms. :-

TABLE 4.21

Total Installation and Other Costs for Traditional Technologies (In Thousand Taka)

Type of Technologies	Year of Installation/Replacement	Total Cost	Total Cumulative Cost
Pit Loom	3	157.68	157.68
(Stage II + III)	9	220.75	378.43
	14	275.94	654.37
	19	331.13	985.50
C.R Loom	3	365.00	365.00
(Stage II + III)	14	638.75	1003.75

The initial and the total cumulative costs required by the Pit looms are Tk.157.68 and Tk.985.50 thousand respectively, while for C.R looms they are Tk.365 thousand and Tk.1.0 million respectively. Although, the initial installation cost of the C.R looms is 2.3 times more than the Pit looms, but the differential reduces by 1.5 per cent when the cumulative costs are considered over the life of the project. When comparing the installation and the other costs with those of modern and intermediate weaving, it appears that Pit loom requires only 4.3 to 5.6 per cent of modern, 2.4 per cent of pedal and 3.36 per cent of power weaving respectivley . While the C.R loom requires between 6.7 to 8.5 per cent of modern , 17.9 of pedal and 10.8 per cent of power loom weaving installation and other costs respectively.

Working Capital (Cost Element - V)

The estimates of working capital required for the handloom have been made by employing a method different from that adopted for modern and intermediate technologies. The working capital required for a single loom would be estimated first of all and then from the total number of Pit and C.R looms selected the total working capital would be established. Sen has suggested that the working capital needed would depend mainly on the time lag between payment to the owners of current input and the receipt of sales value of the subsequent output. The magnitude of the lag would depend not merely on the technical speed of production but on marketing lags. He sees a difficulty in measuring this lag and has assumed it to be 3 months. 6/ The handloom survey observed that the working capital requirement relied heavily on the length of the ' Tana ' (warp) beam. The longer the length of the warp beam , more money is tied up in the looms. It has further been observed that , the handloom weavers somehow succeed in raising the money to purcahse the total yarn required for the warp beam. 7/ Once the entire warp beam is installed , they

6/ Choice of Techniques, An Aspect of the Theory of Planned Economi Economic Development, by A.K Sen,Basil Black well, Oxford,1972, Appendix C pp. 101-2.

7/ They raise the working capital from the Mohajan(local money lender)and those who cannot raise enough money usually have short tana (warp) length ,sometimes as short as 50 yards.

take the finished output from the cloth beam off twice a week and sell them in the local markets. The weekly revenue is then distributed for any payments to be made to the hired hands or for spares. It also appears from the survey that the elements of the working capital viz.stock of raw material. finished goods and spares, cash-in-hand are not exactly applicable. when determining the working capital requirement of the handloom weavers. It is the material in progress i.e the yarn in the warp beam which is the most important element of the working capital. This observation corresponds with the parameter already suggested by Sen.

In order to estimate the working capital required, it would be essential to make some assumptions about the source of input, the total yarn requirement and the marketing lag involved in receiving the revenue. For the purpose of this study, it would be assumed that the handloom weavers are able to buy their yarn from the Bangladesh Handloom Board Distribution Centre (See Chapter -2) and would pay an additional 10 per-cent on mill price for a unit quantity of yarn (lb) to cover the transportation and distribution costs. The marketing of the output could be done in the local market or to the Handloom Board twice during the time period required to weave a full length of warp beam . It has been assumed that the revenue received in between this period would go towards the payment if any required of hired-hands, spares and other costs. It is therefore, essential to know the quantity of yarn required in a warp beam which depends on the length of the warp beam and the construction of the grey cloth. The cloth construction has already been specified and also the length of the ' Tana ' (warp beam) for the Pit and C.R looms for the Service Centre which are 200yds. and

300 yds. respectively. It would be possible to calculate the time lag involved in the weaving of a full length warp from the daily production rate estimated for the Pit and the C.R looms, earlier. It would embody time lag of 1 and 2 months for Pit and C.R loom respectively. The working capital for Pit and C.R looms would therefore , be assumed to be the total cost needed to install a full ' Tana '(processed warp) in the looms.

The cost required for the full beam (processed warp) would comprise of Yarn and 20 per cent additional cost on yarn cost for sizing materials and other costs. Accordingly, the working capital for Pit and C.R looms have been calculated and given in appendix 6.5 The build-up of their working capital requirements would be very similar to those of modern and intermediate technologies.

The table 6.22 below furnishes the per loom total working capital requirement of Pit and C.R looms.

TABLE 6.22

Working Capital Requirement of Traditional Technologies

Types of Technologies	Wrkng.Cap/ Loom (Tk.)	Number of Looms	Total W.Cap. (Mill.Tk.)
Pit Loom	1,060	13,824	14.65
C.R Loom	1,860	10,636	19.78

The per loom working capital requirement for Pit and C.R looms are Tk. 1,060 and Tk.1,860 respectively, while the total requirements are Tk.14.65 million and Tk.19.78 million respectively. The increase in requirement for C.R looms of Tk.5.13 million i.e of 35 per cent is due to a longer warp length of these looms. When compared with the working capital requirements of the organised sector it appears that the Pit and C.R looms entail between 41.82 to 42.41 and 56.47 to 457.26 per cents of UK, Japanese, Rumanian and Indian weaving technologies. While compared to the RFC pedal and power looms, pit and C.R looms require about 38.3 and 51.7 per cent of the pedal and 39.1 and 52.83 per-cent of the power loom respectively.

Total Investment Costs of Traditional Technologies

The total cost requirements of the traditional technologies viz. Pit and C.R looms could be determined by combining the cost components which have been established . These would give the total investment costs necessary for the yarn from the organised and the decentralised sectors to be processed at the traditional sector , the output of which would attain the comparable output level (Q). For the purpose of comparison with the modern and intermediate technologies, it has been assumed that the preparatory equipment and looms have been installed as new at their market prices. All the investment costs are incurred at the beginning of the year 3 (see appendix 6.12) while the start-up production takes place at the end of the year . The total investment costs required have been given in the table 6.23 .

TABLE 6.23

Total Investment Cost Required for Traditional Technologies
(In Million Taka)

Types of Technologies	Total Costs	Cost Index (Pit loom)
Pit loom	250.68	100
C.R loom	256.58	102.4

The total investment costs required by the Pit and the C.R looms are Tk.250.68m and Tk.256.58 million respectively. The cost needed by the C.R loom is marginally higher than that for the Pit loom i.e 2.5 per cent only.

Selvedge Values of The Technologies

The selvedge values of the modern, intermediate and traditional technologies have been determined from the information collected from the BTMC and the Handloom Survey. Because of the varying nature of the technologies and the various types of construction required for them, the selvedge value differentials for the technologies are significant. The selvedge values have been calculated by assuming the value of the investment at the end of the project as a percentage of the present cost.

Modern Technologies

The selvedge value of the modern technologies have been assumed to be 100 per cent of the land, 50 per cent of the building, 75 per cent of the machinery and equipment costs and 100 per cent recovery of the working capital. 8/ The appendix 6.6 shows that the selvedge values are Tk.69.87m, Tk.68.00m, Tk.65.04m and Tk.65.72 million for spinning and Tk.139.67m, Tk.138.65m, Tk.136.84m and Tk.138.88 million for the composite units of UK, Japanese, Indian and the Rumanian sources respectively. The differential between the highest (UK) and the lowest (India) selvedge value recovery are 7.42 and 2.67 per cent for the spinning and the composite units respectively. The differential is more significant for the spinning than the composite unit.

Intermediate Technologies

The selvedge values of the intermediate technologies have been calculated assuming them to be 100 per cent of land value, 25 per cent of the building costs and 100 per cent recovery of the working capital. Low selvedge value has been assumed for building costs as the roofs are of tin instead of concrete construction. As the machinery were re-built and redesigned, it has been assumed that they would not have any selvedge value at the end of the project life. The appendix 6.11shows the selvedge value

8/ Feasibility Study for a Textile Finishing Plant in Tongi, Op.cit. p. 51.

of the Service Centre, the ATDA pedal, RFC power and the KVIC hand-spinning and the RFC composite unit with pedal and power looms. The selvedge value of the Service Centre is Tk.20.81 million, while for the ATDA pedal, RFC power and the KVIC hand-spinning are Tk.37.30m, Tk.46.92m and Tk.90.67 million respectively. The selvedge value of the KVIC unit is 2.43 and 1.93 per cent more than the ATDA pedal and the RFC power spinning. Its selvedge value is also between 29.77 and 39.40 per cent more than the UK, Japanese, Rumanian and the Indian technologies. The RFC composite unit with pedal and power looms has selvedge values of Tk.94.73m and Tk.66.22 million respectively. The pedal loom composite unit has 43 per cent more selvedge value than the power loom, however, in compared to the modern technologies it is only between 67.82 and 69.23 per cent of the UK, Japanese, Rumanian and the Indian technologies. On the other hand, the power loom composite unit has a selvedge value of only between 47.41 and 48.39 per cent of the corresponding technolog sources.

Traditional Technologies

The selvedge values of the traditional technologies come only from the land and the recovery of the working capital. While there is no selvedge value of equipment, looms and the working sheds. The appendix 6.12shows the selvedge values of the Pit and the C.R looms which are Tk.11.12m and Tk.13.4 million respectively. The C.R loom has 20.5 higher selvedge value than the Pit loom. As may be noted that the selvedge values of the Pit and the C.R looms are significantly lower than the modern and the intermediate technologies.

OPERATING COSTS OF THE ALTERNATIVE TECHNOLOGIES

The previous sections have established the detailed investment costs required for all the alternative technologies in the organised, decentralised and the traditional sectors. It is essential now to calculate the operating costs needed by these technologies in order to make an economic appraisal of these alternatives. The complete textile production process which has been divided into four stages of production needs a close examination when calculating the operating costs. In the organised sector, the modern spinning unit (Stage I, II and RF) supplies yarn to the Service Centre and the Handloom weavers. It would therefore be necessary to calculate the operating costs for all sources of modern spinning technologies viz. UK, Japanese, Indian and Rumanian, before these could be combined with the Service Centre and the Handloom to establish a complete technology. For modern composite unit,(Stages I to IV), the operating cost required for all the alternative technology sources need to be established in order to obtain the optimum composite technology. In the decentralised as well, the operating costs essential for the ATDA pedal, RFC power and the KVIC hand-spinning need to be ascertained to combine with the handloom technology. The operating cost incurred by the Service Centre also requires to be determined in order to combine it with modern spinning and handloom weaving. For composite pedal and power loom unit likewise the modern composite unit, the operating cost would have to be found for individual technologies so as to establish the optimum composite technology in the decentralised sector. Finally, the operating costs required by the Pit and the C.R loom have to be established separately in order to determine the optimum weaving technology within the traditional sector,. It , therefore, appears that it is not necessary to establish the operating cost requirements of the individual stages, rather the costs required for the spinning unit (Stage I+II+ RF) and the composite unit of both the organised and the decentralised sector technologies, Service Centre and finally for Pit and C.R looms (Stage II and III) of the traditional technologies would be needed for economic evaluation.

In order to assist in the determination of the operating costs , it has been decomposed into five (5) cost elements, the total operating cost would, however combine all these cost elements. It is relevant at this stage to note that the operating cost would be built-up from the start-up time to full production level. As has been assumed that in the year 3, the production level attained would only be 12 per cent , while in the 4th and the 5th years it would reach to the level of 84 and 100 per cent respectively. The operating cost would also build-up accordingly. The elements of the operating costs can be expressed as follows :-

I) Raw-material costs
II) Spares and accessories costs
III) Power, fuel and Water costs
IV) Labour and Administration costs
V) Other costs.

All these cost elements would be established separately, however, the text would only furnish the total maximum build-up operating cost which remains constant during the life of a project , while the appendix would provide the yearly build-up.

It has been discussed in Chapter-4 that the comparable output level has been determined on the basis of the expected level of spindle production at 300 working days per annum for modern technology. However, the actual productivity level in Bangladesh falls much below the expected or the manufacturer's recommended level. It was seen in Chapter-4 that the estimated actual level of productivity fell much below the expected level and failed to coincide with the comparable scale of output (Q) even after making adjustments for higher machine speed of 1981 machinery. An attempt was therefore made in section to increase the number of working days beyond 300 to reach the comparable scale. As a result of which, the number of working days had been increased to 340 to 362 per annum (See table 4.14). This had its obvious advantages as with the increase in working days the utilization of machinery increases which does not necessarily mean escalation in investment costs but rather an increase in the operating cost as more labour hours are required, more power is being consumed and more spares are needed, etc. The operating costs for both expected and the estimated productivity level would be estimated in order to take into account the loss in profitability due to operating and management ineffeciency. This has an obvious advantage as Pickett and Robson (1981) have concluded in their study that an increase in effeciency in the developing countries could be more beneficial than the uncritical choice of technology. Such increase in effeciency will equal the expected and the estimated actual level of productivity and operating cost. Achievement of such effeciency is evident in Hongkong and in some African countries. The operating cost requirements would first be calculated for the modern then the intermediate and finally the traditional technologies for the production stages discussed earlier.

Modern Spinning and Composite Technologies

Operating costs required for spinning and the composite units have been calculated in accordance with the five (5) cost elements established earlier. These cost elements would be calculated for UK, Japanese, Indian and Rumanian spinning and composite technologies separately. Each of the cost elements would provide the total maximum build-up of operating cost at the actual and expected productivity levels.

Annual Raw Material Cost (Cost Element - I)

The raw-material cost comprises of raw-cotton and sizing material costs and material transfer tax within the factory-shed. The tax imposed for material transfer is applicable in the case of intermediate products i.e on the yarn when it is transferred from the spinning to the weaving section. This tax is Tk.0.35 per lb. of yarn which is to be added to the cost of the composite units, while for the spinning units, the taxes are paid by the purchasers. The calculation of raw-material costs for the spinning units exclude the sizing materials . The raw-cotton requirement would vary across the alternative technologies, as the wastage level of these technologies differs. Wile for composite unit, the cotton is processed in the same factory shed, and the yarn is directly transferred to the weaving-shed therefore its sub-process wastage level is low and the total raw-cotton requirement is also low. The raw-cotton requirement of modern spinning and weaving technologies have , therefore, been estimated for the above three (3) levels. It would be relevant to mention here that the total raw-cotton requirement would be met by 80 per cent fresh raw-cotton of 1.062 inch staple length and 20 per cent usuable waste The selected yarn of 32s count is a medium quality yarn , an it was observed in the 18 surveyed mills that yarn of such quality is produced by mixed cotton l.e fresh and usuable cotton mixed in the ratio of 80:20. 1/ The raw- material requirements for the three levels mentioned have been estimated and shown in appendix 6.13 It has been found that the overall cotton waste for the spinning is about 12.86 per cent . Out of the total wastage , 40 per cent is unuseable, while 60 per cent is saleable in the market for different end uses.

As has been mentioned earlier, the raw-cotton is almost entirely imported, while the usuable waste cotton is locally available from other mills or from own cotton waste. The C&F and ex-factory cost of raw-cotton are Tk.12.08 and Tk.6.0 respectively which have been estimated from the surveyed mills and the BTMC Planning and Development Department. The fresh raw-cotton , besides the C&F cost is subject to 3.5 per cent import duty and 20 per cent for sales tax, while landing , transportation and other miscellaneous expenses are estimated to be another 3.5 per cent on the C&F. In total , an additional 27 per cent on CIF prices need to be added for total raw-cotton cost at the factory-site. However, the ex-factory cost of waste cotton is inclusive of all these costs and are not subject to any duties and taxes. The details of the yearly costs for fresh and usuable waste cotton have been given in appendix 6.14

Table.6.24 below shows the raw-cotton costs for 3 level of inputs of the three different technologies. It has been assumed that the raw-material requirement for actual and the expected production level do not vary as the wastage level at the sub-process stages remain the same. The table shows the raw-material cost of the spinning and composite technologies. The cost of the composite technology include the cost of the sizing materials which has been estimated to be 3 per cent of the raw cotton cost.

TABLE 6.24

Annaul Raw-Material Cost for Modern Technologies
(In Million Taka)

Type of Technologies	Input Technology	Raw-Cotton Cost	Excise/ Taxes	Sizing Materials	Total Cost
Spinning Unit (I + II + RF)	Service Centre	88.11	-	-	88.11
Spinning Unit (I + II + RF)	Handloom	88.78	-	-	88.78
Composite Unit (I to IV)	Composite Weaving	85.96	2.58	1.94	90.48

The total raw-cotton cost for input to the Service Centre, Handloom and the Composite Weaving are Tk.88.12 million, Tk.88.78 million and Tk.85.96 million.respectively. The cost of raw-cotton as input for the Handloom and the Service Centre weaving should be higher by 2.5 and 3.28 per cent than the Composite unit in order to meet the comparable scale of output (Q). The total raw-material cost required by the Composite unit is Tk.90.48 million, Which includes Tk.2.58 million and 1.94 million for excise duty and sizing material costs respectively.

Spares and Accessories Cost (Cost Element - II)

The total spares cost comprises of the cost of spares for local and imported machinery. It has been established from the survey of the 18 mills that the annual (i.e 300 days) spares cost would be about 2 and 3 per cent of the CIF and ex-factory cost of the imported and local machinery respectively. Spares cost for the local machinery would be entailed at the very start-up period i.e at the end of the 3rd year, while for the imported machinery this oost would be taken from the 6th year, as because the cost of the later includes spares supply for two years. At the 6th year ,the total annual spares cost would reach its maximum and as has been established earlier(See Working Capital) 75 per cent of the total spares cost would include imported spares while the remaining 25 per cent would be met by local supplies. The imported spares cost at the factory-site would include the CIF cost, 15 per cent import duty, 2.5 per cent landing and transportation costs and 2 per cent miscellaneous and other costs i.e an additional 20 per cent would be on CIF cost need to be assumed to obtain the total spares costs. For local spares, an additional 25 per cent on ex-factory cost need to be taken into account, which would comprise of 20 per cent excise duty, 2 per cent transportation costs and 3 per cent miscellaneous and other costs. In accordance with this the total consumption costs of the imported and local spares for UK, Japanese, Indian and RumanianSpinning and Composite units have been calculated and given in appendix 6.15 . The appendix also shows the yearly consumption from the start-up period to the 6th year when the maximum consumption is attained.

The consumption costs for spares so far calculated have been based on 300 working days operating at the expected productivity level. However, it has been seen that to maintain the comparative scale of output (Q) by the Service Centre and the Handloom , the spinning units require to process 2.5 and 3.28 per cent more raw-material because ofhigher sub-process level wastage . It has been calculated that at the expected production level , the spinning unit need to be operated for 308 to 310 days as compared to the Composite unit where the yarn is directly transfered to the weaving section(See table 4.14). Moreover, if the estimated actual productivity level is taken into account the processing time required would further increase i.e the number of working days would be beyond 300 days/. (table 4.14) It has been assumed that the spares cost would also increase proportionately with the extra operational days:

$$\text{i.e} \qquad S = \frac{Sc}{300} \times D \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots (F)$$

Where S = Spares cost required for the number of working days

Sc = Spares cost for 300 days.

D = The number of working days.

According to the **equation** (F), the spares cost of the extra working days have been calculated . **Table** 6.25 gives the annual spares costs incurred for spinning unit which supplies yarn to the Service Centre and the Handloom , and for the Composite unit by the alternative technology sources viz. UK, Japan, India and Rumania.

The table highlights three factors : (a) the variations in the cost of spares among the different technology sources, (b) the variations in costs due to the processing of variable amount of raw-cotton and (c) the variations due to the difference between the expected and estimated actual levels of production. The most significant difference is among the alternative technology sources, for spinning unit which supplies yarn to the Service Centre. The cost of spares are Tk.2.87m, Tk.2.98m, Tk.3.68 and Tk.4.18 million for Indian, Rumanian ,Japanese and UK technologies respectively i.e the cost of spares increases if the source of technolgy is UK instead of India by 45.64 per cent. This idifference would be the same for the spinning unit when it provides yarn to the handloom weavers, the consumption of spares would increase in proportion to the number of working days. For the composite unit, the spares cost are Tk.5.73m,Tk.5.94m,Tk.6.29m,and Tk.8.21m respectively , the highest cost being for UK and the lowest for the Indian technologies,i.e an increase in cost of 43.10 per cent for the UK.

Finally the table shows the difference in spares cost due to the variations in the expected and the estimated actual productivity levels. The cost for the spinning unit would increase between

TABLE 6.25

ANNUAL SPARES COST OF MODERN TECHNOLOGIES
(In Million Taka)

Types of Unit	Input To :	U.K Working Days	U.K Cost	JAPAN Working Days	JAPAN Cost	INDIA Working Days	INDIA Cost	RUMANIA Working Days	RUMANIA Cost
AT EXPECTED PRODUCTIVITY									
Spinning(I+II+RF)	S.C 1/	308	4.19	308	3.68	308	2.87	308	2.98
Spinning(I+II+RF)	Handloom	310	4.21	310	3.70	310	2.89	310	3.21
Composite(I to IV)	M.W 2/	300	8.21	300	6.29	300	5.73	300	5.94
AT ESTIMATED ACTUAL PRODUCTIVITY									
Spinning(I+II+RF)	S.C	349	4.74	341	4.07	359	3.35	352	3.41
Spinning(I+II+RF)	Handloom	351	4.77	343	4.10	362	3.38	355	3.44
Composite(I to IV)		3/340/ 343	9.34	332/ 343	7.06	351/ 343	6.62	344/ 343	6.80

Note: 1/ S.C : Service Centre
2/ M.W : Modern Weaving
3/ Working Days : Spinning/ Weaving

10.71 to 16.55 per cent and 10.64 to 16.77 per cent for Japanese, UK, Rumanian and Indian technologies, when supplying yarn to the Service Centre and the Handloom sectors respectively. The Japanese technology would have the lowest increase in spares cost as it is found to have the highest productivity level among the technologies considered, while the Indian would have the lowest. The cost of spares increase for the Composite units and are between 12.25 15.64 per cent for Japanese, UK, Rumanian and Indian technologies, and once again the Japanese (Composite unit) technology has the lowest while the Indian the highest spares costs.

Power, Fuel and Water Cost (Cost Element - III)

The observed power consumption based on 300 production days at the expected productivity level and with the spindle speed for both spinning and composite units have been given in tables 5.4 and 5.8 . The power consumption of the spinning unit which supplies yarn to the Service Centre and the Handloom weavers, have been adjusted according to the formula (F) derived earlier. The power consumption at the actual level of productivity requires adjustment, as the operating spindle speed is lower than the expected productivity level. As has already been mentioned that the absorbed power consumption of the machinery varies with the machine or spindle speed or with the yarn count. According to the Figure 4.6 , at actual spindle speed between 10,000 to 10,500 r.p.m, the adjustment factor would be 0.889 The absorbed power consumption of the spinning and the Composite units expected productivity level would have to be multiplied by 0.889 for spinning , while for the weaving section , with a factor of 0.938. The cost per KWh. of power is taken as Tk.1.05 which is the industrial cost per unit. The cost of power consumption for lighting and miscellaneous purpose have been estimated with the help of the equation 1 (F). The details of the power consumption in KWh at the expected and actual productivity levels with the yearly cost build-up for the total production have been furnished in appendix 6.16. Table 6.26 shows the total maximum cost at the 5th year, after which the power cost remains constant for both expected and actual productivity levels during the project life-time. The table also provides the fuel

TABLE 6.26

ANNUAL FUEL AND POWER COSTS OF MODERN TECHNOLOGIES
(In Million Taka)

Types of Unit	Input To	UK Work Days	UK Fuel Cost	UK Power Cost	UK Total Costs	JAPAN Work Days	JAPAN Fuel Cost	JAPAN Power Cost	JAPAN Total Costs	INDIA Work Days	INDIA Fuel Cost	INDIA Power Cost	INDIA Total Costs	RUMANIA Work Days	RUMANIA Fuel Cost	RUMANIA Power Cost	RUMANIA Total Costs
AT EXPECTED PRODUCTIVITY																	
Spinning(I-II-RE)	Service Centre	308	0.41	10.85	11.26	308	0.41	9.55	9.96	308	0.41	10.36	10.77	308	0.41	10.13	10.54
Spinning(I-II-RE)	Handloom	310	0.41	10.92	11.33	310	0.41	9.61	10.02	310	0.41	10.43	10.84	310	0.41	10.10	10.61
Composite(I to IV)	Modern Weaving	300	0.70	26.60	27.30	300	0.70	27.10	27.80	300	0.70	25.80	26.50	300	0.70	26.00	27.00
AT ESTIMATED ACTUAL PRODUCTIVITY																	
Spinning(I II RE)	Service Centre	340	0.47	11.22	11.69	341	0.45	9.69	10.14	359	0.48	11.03	11.51	352	0.47	10.59	11.06
Spinning(I II RE)	Handloom	351	0.47	11.29	11.76	343	0.46	9.74	10.20	362	0.48	11.13	11.61	355	0.47	10.68	11.15
Composite(I to IV)	Modern Weaving	a/340/ 343	0.80	27.67	28.47	a/332/ 343	0.79	28.08	28.87	a/351/ 343	0.81	27.12	27.93	a/344/ 343	0.80	27.80	28.60

Note: a/ Working days for Spinning/Weaving cost which has been assumed to be identical for all the technology sources. This cost has been estimated from the surveyed mills and based on 300 working days and is Tk.413,3 and Tk.700.0 thousand for spinning and composite units respectively.The fuel cost has to be adjusted according to the number of working days applying the equation (F). Finally, there has been no separate provision for the water cost rather it has been assumed that the lightening and miscellaneous power cost would accomodate the water cost.

The variations in the costs of power and fuel consumption could be explained in the same manner as for the spares costs. For spinning , the cost varies by Tk.9.95 million to Tk.11.26 million among Japanese, Rumanian, Indian and Uk technologies,when supplying yarn to the Service Centre i.e a difference of 13.16 per cent between the highest and the lowest consumptions. This difference would be identical for the spinning unit when it supplies yarn to the handloom weavers, the consumption of spares increases proportionately with the number of working days. For Composite unit, the power and fuel cost increases require different explanations. Japanese composite technology has the highest consumption cost of Tk.27.89 million followed by Rumanian(Tk.27.60m);UK(Tk. 27.30m) and Indian(Tk.26.56m)technologies,i.e India has the lowest / The difference in cost between the highest and the lowest consumption requirements of power and fuel is 5.0 per cent. The power and fuel costs required by the alternative sources of spinning and composite technologies experience relatively less variations than the cost of spares. Although the Japanese spinning unit has the lowest and the UK , the highest power and fuel costs, but for the composite unit this order changes due to the large number of looms required for the Japanese technology in order to achieve the comparable scale of output(Q). Finally the variation in the power and fuel costs due to the expected and the estimated actual production increases between 1.93 to 6.78 and 1.87 to 6.96 per cent for Japanese, UK, Rumanian and Indian technologies when yarn is being supplied by the spinning units to the Service Centre and the handloom weavers respectively. For Composite unit, the power and fuel costs increases by 3.54 to 5.12 per cent for Japanese, Rumanian, Uk and the Indian technologies.

Although, the Japanese composite technology has the highest power cost at the expected productivity level, but the increase in cost is a minimum among all the alternatives abecause of higher overall productivity level.

Labour and Administration Cost (Cost Element - IV)

The wages and salary structure of the BTMC has been used to calculate the modern sector wage and administrative costs (See Chapter - 4). It was seen in Chapter-4 that these wages have been classified according to their skill composition, while the administrative salaries according to their administrative grades. The total annual wages and salaries calculated had included all the allowances for the operatives and the administrative staff. In the section on the selection of machinery,a detailed discussion on the requirement of the number of operatives and administrative staff according to their skill composition and adminstrative grades,has been put forward. From the total number of operatives and administrative personnel already established the total wages and salaries required for them may be calculated. The total wages and salaries cost would be maximum from the 4th year when the 84 per cent of the output level is achieved and would remain constant during the project life-time. However, it has been assumed that the recruitment of the workers would start from the very beginning of the 3rd year as they would be required to help with installation and other works. They will be trained in the process and eventually some of them would be recruited as semi-skilled operatives. While the supervisory staff and the skilled operatives would be directly appointed and assumed/to be from the local people. At the initial stage all the operatives would be paid an identical wage rate same as for the un- skilled operatives. It has been assumed that in the 3rd year, the total wages accumulated would be for 3 months for all the operatives. The administrative workers would in fact , be appointed from the time of the construction of the project, and would gradually reach its total strength in the 4th year. All administrative salaries for year 1, 2 and good part of the 3rd year had been included in the overhead cost of the project during its construction period, while the last

3 months of the 3rd year and the costs incurred during this period have been included in the operating costs. The build-up of the administrative salaries and allowances reaches its peak during the 3rd year. The total annual wages cost has been estimated based on 390 working days, however , if the number of working days exceeds 300 then the equation(F`)would be be applied to determine the additional wage cost. No additional salaries would be considered for administrative staff, as because in Bangladesh although many mills have 345 production days but the administrative staff work on the basis of 300 days. Nevertheles , the adminstrative overhead have been increased for mills which work more than 300 days and have been included in 'other costs' (i.e Cost Element - V). The appendices 6.17 show the total wages and salaries according to their skill composition and administrative grades. The table 6.27furnishes the total wages and salaries cost for UK, Japan , Indian and Rumanian technologies. These costs remain constant during the life-time of the project.

The table shows that the wages and salaries cost of the spinning units are Tk.7.53m, Tk.7.64m, Tk.7.80m and Tk.8.08 million for UK, Japanese, Indian and Rumanian technologies respectively when supplying yarn to the Service Centre. These cost increase to Tk.7.57m Tk.7.68m,Tk.7.83m and Tk.8.12m for the corresponding technologies when supplying yarn to the handloom weavers. The wage cost differential between the UK and the Indian technologies for yarn supply to the Service Centre and handloom weavers are 7.30 and 7.4 per cent / respectively. For the composite unit, these costs are Tk.12.31m, Tk.12.61mm, Tk.17.70m and Tk. 12.90 million for UK, Japanese, Indian and Rumanian technologies/respectively i.e a difference of 5.3 per cent between the UK and the Indian technologies.

Finally, in order to maintain the comparable scale of output (Q) the wages and salaries cost at the estimated actual level becomes higher than the expected level of productivity. The table shows/shows the wages and salaries cost for spinning unit suppling yarn to the Service Centre increases by 8.24,10.22,11.26 and 12.82 per cent for Japanese,UK,Rumanian and Indian technologies respectively,correspondingly by 8.20,10.17,11.45 and 13.02 when supplying the same to the Handloom weavers. The lowest wage and salaries cost for the spinning units

TABLE 6.27

ANNUAL COSTS OF WAGES AND SALARIES OF MODERN TECHNOLOGIES
(In Million Taka)

Types of Unit	Input To :	U.K Working Days	U.K Cost	JAPAN Working Days	JAPAN Cost	INDIA Working Days	INDIA Cost	RUMANIA Working Days	RUMANIA Cost
AT EXPECTED PRODUCTIVITY									
Spinning(I+II+RF)	S.C 1/	308	7.53	308	7.64	308	7.80	308	8.08
Spinning(I+II+RF)	Handloom	310	7.57	310	7.68	310	7.83	310	8.12
Composite(I to IV)	M.W 2/	300	12.31	300	12.61	300	12.70	300	12.98
AT ESTIMATED ACTUAL PRODUCTIVITY									
Spinning(I+II+RF)	S.C	349	8.30	341	8.27	359	8.80	352	8.99
Spinning(I+II+RF)	Handloom	351	8.34	343	8.31	362	8.85	355	9.05
Composite(I to IV)		3/ 340/ 343	13.36	332/ 343	13.97	351/ 343	14.[illegible]1	344/ 343	14.54

Note: 1/ S.C : Service Centre
2/ M.W : Modern Weaving
3/ Working Days : Spinning/ Weaving

supplying yarn to the Service Centre and the Handloom weavers is occupied by the Japanese source, while the highest for the former is occupied by the Rumanian technology and for the latter by the Indian . For composite unit, the wage and salaries cost increases by 8.52, 10.78, 12.02 and 12.68 per cent for the UK, Japanese, Rumanian and Indian technologies respectively. The UK technology has the lowest wage and salaries cost and also the lowest increase followed by the Japanese, Rumanian and the Indian technology.

Other Costs (Cost Element - V)

Other costs include adminstrative overhead, office and factory maintenance and miscellaneous expenditures. Administrative overheads for stationery, etc have been estimated to be 20 per cent of the administrative salaries at the expected productivity level for 300 working days, however it increases to 30 per cent for the actual productivity level. As the adminstrative and management personnel required are the same for all the alternative technology sources , the adminstrative overhead for them is also identical. The office and maintenance cost has been assumed to be identical for all sources of technology and has been estimated to be Tk.700 thousand for the Composite and Tk.400 thousand forspinning units respectively. The miscellaneous cost has been estimated to be 2 per cent of the total labour and administrative costs. The 'Other Costs' reaches its maximum at the 6th year and remains constant during the project life-time. The appendix 6.18 gives the yearly build-up of the 'other costs', while the table 6.28 shows the maximum costs.

The total expenditures involved in 'other Costs' as shown in table varies between Tk.904 and Tk.915 thousand for UK, Japanese, Indian and Rumanian spinning units supplying yarn to the Service Centre. The difference between the lowest and the higest costs occupied by UK and the Rumanian technologies respectively is only 1.23 per cent and remains identical for spinning units supplying yarn to the handloom weavers. Similarly for the Composite unit, UK occupies the lowest requirement of 'other cost' of Tk.1.37 million and Rumania the highest of Tk.1.38 miilion , the difference

TABLE 6.28

ANNUAL OTHER OPERATING COSTS OF MODERN TECHNOLOGIES
(In Million Taka)

Types of Unit	Input To :	U.K Working Days	U.K Cost	JAPAN Working Days	JAPAN Cost	INDIA Working Days	INDIA Cost	RUMANIA Working Days	RUMANIA Cost
AT EXPECTED PRODUCTIVITY									
Spinning(I+II+RF)	S.C 1/	308	0.904	308	0.906	308	0.910	308	0.915
Spinning(I+II+RF)	Handloom	310	0.905	310	0.907	310	0.910	310	0.916
Composite(I to IV)	M.W 2/	300	1.372	300	1.378	300	1.380	300	1.385
AT ESTIMATED ACTUAL PRODUCTIVITY									
Spinning(I+II+RF)	S.C	349	1.096	341	1.095	359	1.105	352	1.109
Spinning(I+II+RF)	Handloom	351	1.097	343	1.096	362	1.107	355	1.111
Composite(I to IV)		3/ 340/ 343	1.606	332/ 343	1.618	351/ 343	1.625	344/ 343	1.629

Note: 1/ S.C : Service Centre
2/ M.W : Modern Weaving
3/ Working Days : Spinning/ Weaving

between them is about 1.02 per cent only. Finally, in order to maintain the comparable scale of output (Q) at the actual productivity level the 'other cost' increases between 20.88 to 21.54 per cent for the spinning units of UK, Japanese, Indian and Rumanian technologies when supplying yarn to the handloom weavers and the Service Centre. For the composite unit it increases between 17.04 to 17.77 per cent for the alternative technology sources mentioned. It appears that the difference between the variation in the other costs requirement of the alternative technology sources is not so significant.

Total/Annual Operating Cost Requirement of the Modern Technologies

The total operating cost requirements of the modern spinning and composite units of the alternative technology sources viz. UK, Japan, India and Rumania can be established by combining the cost elements I to IV. The costs can be calculated at the expected as well as the estimated actual productivity levels. The appendix 6.19 show the build-up of the opereating costs which reach the maximum in the 6th year and remain constant during the project life-time at the expected and the estimated actual productivity levels for all the sources of modern alternative technology .

Table 6.29 shows the maximum annual operating costs for the alternative sources of technology. UK has the highest cost of Tk.112.0m, followed by Rumania(Tk.110.64m),India(Tk.110.47m)and Japanese technologies (Tk.110.0m).The difference in operating costs is not so significant, only 1.54 per cent between the UK and the Japanese technologies. When supplying yarn to the handloom weavers these costs increase to Tk.112.8m,Tk.110.9m, Tk.111.26m and Tk.111.65 million for UK, Japanese, Indian and Rumanian technologies. Again the differential in cost is less significant i.e only 1.71 per cent. For the composite unit, the operating costs are Tk.139.67m, Tk.138.65m, Tk.136.84m and Tk.138.38 million for UK, Japanese, Indian and Rumanian technology sources respectively. Again UK remains the technology occupying the highest operating cost for the composite unit, while the Indian has the lowest.The operating costs at the estimated actual productivity level in order to attain the comparable scale of output (Q) have increased. The table shows that the opera--

TABLE 6.29

TOTAL ANNUAL Operating Costs of Modern Technologies
(In Million Taka)

Types of Unit	Input To :	U.K Working Days	U.K Cost	JAPAN Working Days	JAPAN Cost	INDIA Working Days	INDIA Cost	RUMANIA Working Days	RUMANIA Cost
AT EXPECTED PRODUCTIVITY									
Spinning(I+II+RF)	S.C 1/	308	112.00	308	110.30	308	110.47	308	110.64
Spinning(I+II+RF)	Handloom	310	112.80	310	111.09	310	111.26	310	111.65
Composite(I to IV)	M.W 2/	300	139.67	300	138.65	300	136.84	300	138.38
AT ESTIMATED ACTUAL PRODUCTIVITY									
Spinning(I+II+RF)	S.C	349	113.94	341	111.69	359	112.88	352	112.68
Spinning(I+II+RF)	Handloom	351	114.74	343	112.48	362	113.73	355	113.53
Composite(I to IV)		3/340/343	143.27	332/343	142.01	351/343	140.98	344/343	142.14

Note:
1/ S.C : Service Centre
2/ M.W : Modern Weaving
3/ Working Days : Spinning/ Weaving

ting cost for the spinning units supplying yarn to the Service Centre have increased by 1.26, 1.73, 1.84 and 2.18 per cent for the Japanese, UK, Rumanian and the Indian technologies respectively and correspondingly increases by 1.25, 1.72, 1.68 and 2.22 per cent when supplying yarn to the handloom weavers. It appears therefore, that the increase in the total operating costs incurred by the alternative technology sources is not very significant. This is because the increase in the costs comes from the rise in the wages, power and spares costs which constitute only 20 per cent of the total operating costs, while the raw-material cost forms 80 per-cent. The increase in the operating costs is the lowest for the Japanese spinning unit because of its higher level of actual productivity, while it is the highest for the Indian technology. However, the UK remains to be the source requiring the highest operating costs. For composite units, the operating costs have increased to Tk.143.27m, Tk.142.01m, Tk.140.98m and Tk.142.14 million for UK, Japanese, Indian and Rumanian sources respectively. The Japanese technology has the lowest and the Indian , the highest increase in the operating costs.Nevertheless, the UK incurs the highest operating cost for its composite unit followed by Rumania, Japan and India.

INTERMEDIATE TECHNOLOGY

The operating cost required by the intermediate technology would established following the method adopted for the modern technology. The operating cost would be calculated for the Service Centre, ATDA pedal , RFC power and KVIC spinning and for the/RFC Composite unit with pedal and power looms. The maximum operating costs attained by these technologies remain constant during the project life-time. Each cost element would be given in the tables, while the build-up of the cost elements at 12 and 84 per cent production levels have been given in the appendices 6.20 . At the end of this section a summary providing the total operating costs incurred during the build-up period will be given.

Raw-Material Costs (Cost Element - I)

The raw-material costs for the ATDA pedal, RFC power and KVIC hand spinning will only include raw-cotton costs. While for the Composite unit with pedal and power looms, the costs of raw-cotton and sizing materials would be considered along with the tax for the transfer of intermediate yarn as explained for modern composite technologies. The raw-material costs for the Service Centre would include the cost of the intermediate output (yarn) from the modern sector and the sizing materials. As has already been mentioned that the raw-cotton requirement of the alternative sources of intermediate spinning and composite unit varies according to the different sub-process wastage level. The ATDA pre-spinning supplies 'Roving' to the pedal spinners, who in turn supply yarn to the handloom weavers. While the RFC power and the KVIC handspinners also supply their intermediate product to the handloom weavers. However, the intermediate output of the Composite unit with pedal and power looms is directly tranferred to the weaving shed. Accordingly, the raw-cotton requirement of all theintermediate technologies with the exception of the Service Centre have been calculated using raw-cotton mixed in the prpportion of 80 per cent fresh and 20 per cent useable waste cotton , the sameas for modern technology. The raw-cotton requirement has been given in the appendix 6.13 . It could be seen from the appendix that the overall wastage of the RFC power

power spinning is the same as for modern spinning which is 12.86 per cent , while for the ATDA pedal and the KVIC spinning, the wastage levels are 13.70 and 14.55 per cent respectively. Of the total wastage 40 per cent is useable, while 60 per cent is saleable waste for different end uses.

The raw-cotton costs have been calculated in the same manner as for modern technology and the sizing costs have also been estimated to be 3 per cent of the raw-cotton costs, The yarn requirement of the Service Centre has been based on the objective of matching the comparable scale of output (Q) and would be purchased from the mills at the selling price. The selling price of the mills have been obtained from the BTMC and is Tk.25.13 including Tk.0.35 for excise duty. It has been assumed that the Servic Centre would get its yarn supply from the Handloom Board at a cost, which is 5 per cent higher than the mill price so as to accomodate distribution and other costs . 9/ It would also include another 2 per cent on yarn cost for sizing materials. The raw-material costs for the Service Centre, spinning and Composite unit at maximum productivity level are shown in table 6.30.

9/ It may be mentioned here tha the Bangladesh Handloom Board has at present seven Textile Facility Centres(TFC). It supplies yarn to these centres. The Handloom Board has also distribution centres to sell yarn directly to the handloom weavers.

TABLE 6.30

Annual Raw Material Costs of Intermediate Technologies
(In Million Taka)

Types of Unit	Input To:	Raw-Cotton/ Yarn Cost	Sizing Materials	Excise Tax	Total Cost
Service Centre (Stage III)	Handloom	147.36	2.95	a/	150.31
Spinning Unit					
ATDA/ Pedal Spinning (Stages I+II+RFC)	Pedal Spng.	89.65	-	-	89.65
RFC/ Power Spinning (Stages I+II+RFC)	Handloom	88.78	-		88.78
KVIC/ Hand Spinning (Stages I+II+RFC)	Handloom	90.53	-	-	90.53
RFC Composite Unit					
With Pedal Loom (Stages I to IV)	RFC Pedal Loom Wvg.	86.38	2.59	1.95	90.92
With Power Loom (Stages I to IV)	RFC Power Loom Wvg.	86.38	2.59	1.95	90.92

Note: a/ Yarn costs include excise duty

Comparison of the raw-cotton costs can be made between the ATDA pedal, RFC power and the KVIC handspinning and the RFC composite units (pedal and power looms). The raw-cotton costs would be Tk.88,78 million, Tk.90.53 million and Tk.86.38 million respectively in order to deliver the identical scale of output (Q) at the end of the production process. It appears from the table that the spinning unit supplying yarn to the Composite unit has the lowest cost. The raw-cotton cost of the ATDA pedal, RFC power and the KVIC handspinning have increased by 3.79, 2.78 and 4.8 per cent respectively than the RFC composite unit. Compared to the raw-material cost of the modern spinning, the cost required for the ATDA and KVIC hand spinning are 1.0 and 1.97 per cent higher respectively, while the RFC power spinning has the same cost. The yarn input cost of the Service Centre is Tk.147.36 million which much higher than the input cost of other technologies. This is because it represents the yarn at ex-factory price, excise duty and distribution costs. The ex-factory yarn cost has already included in the raw-cotton cost which takes into consideration value added and any surplus.

Spares Cost (Cost Element - II)

The spares cost,as for the modern technology comprises of the cost of spares for imported and local machinery. The annual spares consumption based on 300 working days is estimated to be 3 per cent for both CIF and ex-factory costs. However, unlike the modern sector, all the spares for the intermediate technology are locally manufactured and supplied. The total cost of the spares would include ex-factory price and an additional 25 per cent on it for excise duty (20 per cent), transport(2 per cent) and miscellaneous costs(3 per cent). The spares cost for imported machinery would be incurred from the 6th year, as the machinery price includes 2 years' spares cost. While for local machinery, it is incurred from the 3rd year. The spares cost would build-up to its maximum in the 6th year and from then on will remain constant during the project life-time. For working days beyond 300, the spares cost would be adjusted on the basis of the equation 'F'. The appendices 6.21 show the build-up of the spares costs on an yearly basis. The table 6.31 below gives the maximum spares costs required by the Service Centre, the spinning and for composite units.

TABLE 6.31

Annual Spares Costs of Intermediate Technologies
(In Million Taka)

Types of Unit	Input To:	At Expected Productivity W.Days	At Expected Productivity Costs	At Est.Actual Productivity W.Days	At Est.Actual Productivity Costs
Service Centre (Stage III)	Handloom	300	0.17	300	0.17
Spinning Unit					
ATDA Pedal Spg. (Stages I+II+RF)	Pedal Charka	300	5.26	300	5.26
RFC Power Spg. (Stages I+II+RF)	Handloom	309	3.12	350	3.12
KVIC Hand Spg. (Stages I+II+RF)	Handloom	300	7.51	300	7.51
Composite Unit					
With Pedal Loom (Stages I to IV)	RFC Pedal Loom Wvg.	300	6.11	a/340/300	6.50
With Power Loom (Stages I to IV)	RFC Power Loom Wvg.	300	5.32	a/340/300	5.71

Note: a/ Working days for Spinning/Weaving

The spares and accessories costs of the Service Centre is Tk.165 thousand and remains the same as the expected productivity level is unchanged at the estimated actual level. The costs of the ATDA Pedal RFC power and the KVIC hand spinning are Tk.5.26 m, Tk.3.12 m and Tk.7.51 million respectively. This shows that the spares cost of the ATDA pedal and the KVIC spinning are 68.6 and 140.6 per cent higher than the RFC spinning respectively. At the estimated actual productivity , the spares and accessories costs of the ATDA pedal and the KVIC hand spinning do not change, while the RFC spinning increases by 13.26 per cent, this increase in cost, however, still remains lower than those for the ATDA pedal and the KVIC power spinning. The spares cost at the estimated actual productivity level for the ATDA pedal , RFC power and the KVIC hand-spinning supplying yarn to the handloom weavers can be compared to the alternative sources of modern spinning technologies furnishing yarn to the handloom weavers . It shows that the ATDA pedal and the KVIC Ambar Charka require spares cost between 10.32 to 55.78 per cent and 57.45 to 122.32 per cent more than the UK, Japanese, Rumanian and Indian technologies respectively. The RFC spinning , on the other hand has spares cost of about 2.95 and 4.66 per cent higher than the Rumanian and the Indian technology sources , and 13.13 and 25.88 per cent lower than the Japanese and the UK. The costs of the RFC Composite unit with pedal and power looms are Tk.6.11 million and Tk.5.32 million respectively i.e the former (pedal looms) requires 14.85 per cent more for procuring spares. At the estimated actual productivity level, the spares costs for pedal and power composite unit increase by 6.38 and 7.33 per cent respectively, and this increase is entirely from the spinning section of the composite unit, as the actual productivity levels were considered for them.

The spares cost of the RFC pedal and power looms at the estimated actual producitivty level compares with the modern composite units quite favourably They have been estimated to be between 1.85 to 30.38 per cnet and 13.78 to 38.84 per cent lower than the Indian, Rumanian and UK composite technologies.

Power, Fuel and Water Costs (Cost Element - III)

The installed and absorbed power costs required by the Service Centre, ATDA pedal, RFC power and KVIC hand spinning and the Composite unit with pedal or power loom have already been given in tables 5.13 and 5.21. These estimates were based on expected productivity and on 300 working days. At actual productivity, adjustments for power consumption costs will have to made. These adjustments are only required for sub-processes upto spinning, as for pre-weaving and weaving , the productivity level for the expected and the actual are the same (See Chapter -5). The spindle speed at the actual productivity comes down from 10,000 r.p.m to 7,500 r.p.m . The adjustment which is 0.90 can be found from the diagram, and is to be multiplied with the absorbed power to determine the power consumption at the actual productivity. Accordingly, the adjusted power consumption costs of the RFC power spinning and the spinning for Composite unit with pedal or power looms have been estimated. The appendix 6.22 shows the details of the power consumptions costs on the basis of actual productivity. However, no adjustment is required for the ATDA pedal and the KVIC hand-driven charkas as the productivity levels considered for these technologies have been established from the survey and the operatives would be working on the basis of 300 days per annum. The power cost for the Service Centre, ATDA, RFC and the KVIC spinning and the RFC Composite units have been given in the appendix 6.20 , these costs have been for shown on an yearly basis. The table 6.32 gives the maximum power consumption at the 5th year, after which it remains constant during the life-time of the project.

The power and fuel costs of the Service Centre is about Tk.593 thousand, which remains constant at the estimated actual productivity . The costs required by the ATDA pedal , RFC power and the KVIC hand-spinning are Tk.4.05 million, Tk.12.64 million and Tk.4.22 million respectively. The power costs incurred by the ATDA pedal and the KVIC hand-spinning are one-third of the RFC power spinning as the ATDA and the KVIC do not consume power at Spinning , and spinning and roving sub-process stages, respectively. The power and fuel costs for the ATDA pedal and the KVIC hand-spinning are the same at expected and estimated actual productivity levels, but as the costs were estimated from the survey.

. However, for RFC power spinning the power and fuel cost at the estimated actual level of productivity increases by 4.45 per cent . The power costs required by the RFC power and the KVIC hand-spinning unit can be compared with the cost requirements of the modern spinning unit which supplies yarn to the handloom weavers. It shows that the ATDA pedal and the KVIC hand-spinning

TABLE 6.32

ANNUAL POWER AND FUEL COSTS OF INTERMEDIATE TECHNOLOGIES
(In Million Taka)

		At Expected Productivity				At Est. Actual Productivity			
Types of Unit	Input To:	W.Days	Power Cost	Fuel Cost	Total Costs	W.Days	Power Cost	Fuel Cost	Total Costs
Service Centre (Stage III)	Handloom	300	0.53	0.06	0.59	300	0.53	0.06	0.59
Spinning Unit									
ATDA Pedal Spg. (Stages I+II+RF)	Pedal Charka	300	3.86	0.19	4.05	300	3.86	0.19	4.05
RFC Power Spg. (Stages I+II+RF)	Handloom	309	12.15	0.50	12.65	350	12.58	0.56	13.14
KVIC Hand Spg. (Stages I+II+RF)	Handloom	300	3.93	0.29	4.22	300	3.93	0.29	4.22
Composite Unit									
With Pedal Loom Stages I to IV)	RFC Pedal Loom Wvg.	300	13.46	0.60	14.06	[a] 340/300	13.87	0.67	14.54
With Power Loom (Stages I to IV)	RFC Power Loom Wvg.	300	25.10	0.60	25.70	[a] 340/300	25.17	0.66	25.83

Note: Working days for Spinning/Weaving.

require between 34.5 to 39.7 per cent and between 37.38 to 41.37 per cent of the UK, Indian, Rumanian and Japanese fuel and power costs. The low range of power cost of the ATDA and the KVIC technologies is due to the manual spinning processes of both the technologies. The power and fuel cost of the RFC spinning is between 11.76 to 28.81 per cent more than the UK, Indian , Rumanian and the Japanese technologies. Although, the relative power consumption per machine of the RFC is less than the modern spinning machinery, however its power consumption is high as it employs a large number of machinery to produce the comparative scale of output(Q). For Composite unit, the power and fuel costs of the pedal and power units are Tk.14.06 million and Tk.25.70 million respectively. The power and fuel consumption costs of the pedal composite unit is only about 55 per cent o the power loom, as the pedal looms do not consume power at the weaving stage . At the estimated actual productivity level, the power and fuel costs of the pedal and power looms increase by 3.42 and 4.98 per cent respectively. and the rise in costs come entirely from the spinning section of the Composite units. The RFC pedal and power composite units, however compare favourably with the modern composite units. Their power costs are between 50 to 52 and 90.70 to 90.46 per cent of the Indian, UK, Rumanian, and Japanese cources of composite technologies.

Labour andAdministrative Costs (Cost Element - IV)

The wages for the intermediate technologies viz. the Service Centre, ATDA (upto Roving) and the KVIC (upto Drawing) preparatory spinning, RFC power spinning and pre-weaving for power and pedal loom (Stage - III) and power loom weaving have been adopted from the BTMC wage grades. This has been done as because the intermedaite sector is not widely established in Bangladesh,therefore, it has been assumed/that the expansion ofthe textile production under this sector would be under public sector initiative (See Chapter - 4). As the skill requirement of the intermediate technology would be at the lower spectrum of the modern sector wages(discussed in Section wages and salaries)the wage scales have been expanded accordingly.

The annual wages and allowances have been caluculated and classified according to their skill composition(tables 5.12,5.17 and 5.19).The total operatives required have also been established in accordance with the skill composition in the table and could be used together to arrive at the total wages cost of the intermediate technologies mentioned above. It is to be noted that the total wage costs required by the ATDA pedal and the KVIC hand-spinning and the RFC pedal loom weaving include wages for the pedal spinner, KVIC rover and spinner and the pedal loom weaver which do not fall under the modern sector wages. These wages have been estimated from the hand-spinning and the handloom weaving survey conducted in Bangladesh and have been given in table 4.18 . The total wages costs required for the pedal and the Ambar rover and spinner and the pedal loom weavers have taken into account these wages. The total administrative salaries for the intermediate technologies have been taken from the BTMC administrative salary grades, however, they have been taken from the lower end of the administrative grades (See table 4.17). The total wages and salaries cost requirements of the intermediate technologies reach its maximum in the 4th year and remains constant thereafter. The costs required at the 3rd year have been estimated to be identical to the modern sector i.e 3 months' wages and salaries.

The total wages and salaries have been estimated for 300 working days, beyond which adjustment would have to be made the same as for modern sector. The appendix 6.23 shows the total wages and salaries costs on an yearly and differential basis, while the table 6.33 below furnishes the maximum wages and salaries cost requirements of all the intermediate technologies :-

TABLE 6.33

Annual Wage Costs of Intermediate Technologies
(In Million Taka)

Types of Unit	Input To:	At Expected Productivity W.Days	At Expected Productivity Costs	At Est.Actual Productivity W.Days	At Est.Actual Productivity Costs
Service Centre (Stage III)	Handloom	300	3.57	300	3.57
Spinning Unit					
ATDA Pedal Spg. (Stages I+II+RF)	Pedal Charka	300	6.79 a/ 56.29 b/ 64.48	300	6.79 a/ 56.29 b/ 64.48
RFC Power Spg. (Stage I+II+RF)	Handloom	309	33.38	350	37.47
KVIC Hand Spg. (Stages I+II+RF)	Handloom	300	118.74	300	118.74
Composite Unit					
With Pedal Loom (Stages I to IV)	RFC Pedal Loom Wvg.	300	92.16	c/340/300	99.48
With Power Loom (Stages I to IV)	RFC Power Loom Wvg.	300	58.26	c/340/300	61.59

Note: a/ Wage cost for ATDA(Roving)
b/ Wage cost for Pedal Spinners.
c/ Working days for Spinning/Weaving.

The wages and salaries costs of the Service Centre is Tk.3.57 million and remains the same as the productivity levels do not change. The costs of the ATDA Pedal and the KVIC spinning units are Tk.63.07 and Tk.118.74 million respectively and they remain constant as well as the productivity level used is the observed level. The wages and the salaries costs of the Ambar charka is about 88 per cent higher than the pedal spinning, the wage cost of the RFC power spinning at expected and estimated actual productivity levels are Tk.30,84 million and Tk.34.94 million respectively. The increase in the wages cost at the actual productivity level is 13.3 per cent. The wages cost of the RFC spinning is only 55.4 and 29.5 per cent of the pedal and the Ambar charka respectively. The wages cost of the ATDA pedal, RFC power and the KVIC hand-spinningoon the other hand are between 7.12 to 7.73,3.69 to 4.02 and 13.12 to 14.24 times higher than Rumanian,Indian,UK and Japanese technologies respectively.The wage cost at the expected and estimated actual productivity for the pedal and power loom Composite units are Tk.61.58m, and Tk.99.48 million and Tk.58.28 million and Tk.61.58 million respectively. This indicates an increase in the wages and salaries costs of 7.9 and 5.7 per cent at the estimated actual productivity levels for pedal and power looms respectively. This increase in the wage cost is entirely from the spinning units, as the productivity levels for both the looms have been from the observed level which are the same for the expected and the estimated actual levels. However, the wages cost of the power loom is only about 62 per cent of the pedal loom composite unit cost. Compared to the modern composite unit, costs at the estimated actual producitivity level, the RFC pedal and the power composite unit wages and salaries cost requirements are between 6.34 to 6.98 and 4.0 to 4.36 times more than Rumanian, Indian, Japanese and Indian technologies respectively.

Other Costs (Cost Element - V)

The components of the the 'Other Costs' are the same as for the modern sector, however but their proportions are not identical. The adminstrative overhead costs which included stationeries, etc for the Service Centre, ATDA pedal , RFC power/spinning and RFC Composite unit with pedal or power looms have been estimated to be 10 per cent of the adminstrative salaries .The miscellaneous costs of the RFC spinning and the Composite units are 1 per cent of the total wages and salaries costs, while for the Service Centre, ATDA pedal and spinning, they are 10 per cent of the administrative salaries. The adminstrative overhead and miscellaneous costs for the KVIC spinning is estimated to be Tk.3.5 thousand per unit. The office and factory maintenance costs have been estimated on the basis of factory units, and the cost required for a single Service Unit is Tk.30.0 thousand and for 3 units Tk.90.0 thousand.The office and maintenance costs for the ATDA pedal and the RFC power spinning and Composite unit with pedal and power looms are Tk.10.0, Tk. 20.0, Tk.75 and Tk.45.0 thousands respectively, while for 20 such units the cost requirements are Tk.200.0, Tk. 400.0 , Tk.1500.0 and Tk. 900.0 thousand respectively. For KVIC spinning Tk.3.34 thousand is required per unit i.e for 240 units it would be Tk.800,000. The total requirement of 'Other Costs' for the Service Centre, intermediate spinning and composite technologies have been given in table 6.34 below (se appendix 6.20).

TABLE 6.34

Annual Other Operating Costs of Intermediate Technologies
(In Thousand Taka)

Types of Unit	Input To:	At Expected Productivity W.Day	At Expected Productivity Costs	At Est.Actual Productivity W.Days	At Est.Actual Productivity Costs
Service Centre (Stage III)	Handloom	300	35.46	300	35.46
Spinning Unit					
ATDA Pedal Spg. (Stages I+II+RF)	Pedal Charka	300	481.04	300	481.04
RFC Power Spg. (Stages I+II+RF)	Handloom	309	987.37	350	1,155.08
KVIC Hand Spg. (Stages I+II+RF)	Handloom	300	1.520.00	300	1,520.00
Composite Unit					
With Pedal Loom (Stages I to IV)	RFC Pedal loom weaving	300	2,883.70	a/340/300	3,187.98
With Power Loom (Stages I to IV)	RFC Power loom weaving	300	1,944.00	a/340/300	2.209.04

Note: a/ Working Days for Spinning/Weaving

The total 'other costs' requirements of the Service Centre is Tk.35.46 thousand at both levels of productivity. While the costs required for the ATDA pedal and the KVIC hand-spinning are Tk.481 thousand and Tk.1.52 million respectively whcih remain constant for both levels of productivity. The costs for the RFC power spinning at expected and the estimated actual productivity level are 0.98 million and 1.15 million respectivley i.e an increase in the cost by 17.36 per cent for the estimated actual level. Among the intermediate spinning technologies , the KVIC has the highest requirement of 'other costs' which is about 31.2 and 32.17 per cent higher than the ATDA pedal and the RFC power spinning. It is also between 36.94 to 39,45 per cent higher than the Indian, Rumanian, UK and the Japanese sources of spinning technologies. The total requirement of the 'Other costs' of the pedal loom at the expected and the estimated actual producitivity levels are Tk.2.88 million and Tk.3.18 million respectively, while for the powerloom, they are Tk.1.94 million and Tk.2.21 million respectively. This indicates increase in the 'other costs' at the estimated actual productivity level of 10.4 and 13.92 per cent for pedal and power loom respectively. The costs needed by the pedal loom is about 44.54 per cent higher than the power loom and is also between 95.2 to 98.75 per cent more than the Rumanian, Indian, Japanese and the UK Composite technologies.

Total Annual Operating Costs of the Intermediate Technologies

The total operating costs of the Service Centre , the ATDA pedal, RFC power, KVIC hand-spinning and the RFC Composite unit with pedal and power looms can be determined by adding up the 5 cost elements already established. tThe operating costs have been given for the production year 6 when the costs reach their maximum ,but thereafter remain constant throughout the life of the project. The appendix 6.20 furnishes the yearly build-up of the operating costs for the alternative technology sources . Table 6.35 overleaf provides the maximum operating costs required,.

TABLE 6.35

Total Annual Operating Costs of Intermediate Technologies
(In Million Taka)

Types of Unit	Input To:	At Expected. Productivity W.Days	Costs	At Est.Actual Productivity W.Days	Costs
Service Centre (Stage III)	Handloom	300	154.67	300	154.67
Spinning Unit					
ATDA Pedal Spg. (Stages I+II+RF)	Pedal Charka	300	163.93	300	163.93
RFC Power Spg. (Stages I+II+RF)	Handloom	309	138.91	350	144.08
KVIC Hand Spg. (Stages I+II+RF)	Handloom	300	222.53	200	222.53
Composite Unit					
With Pedal Loom (Stages I to IV)	Handloom	300	206.13	a/340/ 300	214.62
With Power Loom (Stages I to IV)	Handloom	300	182.14	a/340/ 300	186.25

Note: a/ Working days for Spinning/Weaving.

The total operating costs needed by the Service Centre, the ATDA pedal and the KVIC hand-spinning remain the same at both levels of productivity. This is because , the productivity level taken for the expected and the actual levels is actually the productivity level observed. The total operating costs for these technologies are Tk.154.67 million, Tk.163.92 million and Tk.222.53 million respectively. The operating costs for the RFV power spinning at the expected and the estimated actual level of productivity are Tk.138.91 million and Tk.144.08 million respectively i.e the operating cost increases by 3.72 per cent due to changes in the productivity. At the estimated actual level of productivity, the RFC power spinning has the lowest requirement of operating costs among all the intermediate spinning technologies. Its requirement is 12.10 and 35.25 per cent lower than the ATDA pedal and the KVIC hand-spinning respectivley. The operating costs of the intermediate spinnings at the estimated actual level can be compared with the modern spinning technologies both of which supply yarn to the handloom weavers. It reveals that the ATDA pedal , the RFC power and the KVIC hand-spinning need between 42.8 to 45.7, 25.6 to 28.1 and 93.9 to 97.8 per cent more operating costs than the UK, Indian, Rumanian and the Japanese technology sonrces. The operating cost of the RFC Composite pedal and power loom at the expected and the estimated actual productivity level are Tk.206.13 million and Tk.214.62 million, and Tk.182.14 million and Tk.186.25 million respectively . This indicates that the costs have increased with the different productivity levels by 4.12 and 2.25 per cent for pedal and power looms respectively. At the estimated actual productivity level, the operating costs for the pedal loom is about 15.23 per cent more than the power loom . Compared to the modern composite units, the RFC composite unit has operating costs requirements for the pedal and the power looms which are between 30 to 32.1 and 49.8 to 52.25 per cent higher than the UK, Rumanian, Japanese and the Indian Composite units.

TRADITIONAL TECHNOLOGY

The operating costs required by the traditional technology comprises of four(4) cost Elements rather than five, and would exclude power, fuel and water costs. The total operating costs required for the Pit and the C.R looms (Semi-automatic) would be estimated. separately. The operating cost requirements will build-up from the time of the start-up (i.e the 3rd year) and will reach ithe maximum level in the 6th year and remain constant thereafter throughout the project life-time. The productivity level of the handloom weaving has been taken to be the actual level estimated from the survey of 214 handloom weavers and the operating costs have been calculated accordingly.

Raw-Material Cost (Cost Element - I)

The raw-material cost included the costs for yarn inputs and sizing materials . The yarn would be supplied by the modern, intermediate and the KVIC spinning mills. The amount of yarn which will be processed in the handloom weaving have been estimated to provide the comparable scale of output (Q). The operating costs required for producing this quantity of yarn by the spinning technologies have already been established. The BTMC mill gate price of yarn is Tk.25.13 which includes Tk.24.78 and Tk.0.35 as ex-factory price and excise duty respectively. The price would be maintained for the modern, intermediate and the KVIC technologies. It has been assumed that the Bangladesh Handloom Board would purchase and distribute the yarn to the handloom weavers. The Service Centre which entailed an additional 5 per cent on yarn price to accomodate transportation,distribution and other costs . On the other hand the handloom would require 10 per cent on yarn price to cover such costs,when supplied by the modern sector due to long distributional channels and the handling of small quantity of materials. 10/However, when the yarn is supplied by the RFC and the KVIC spinning units, the additional cost is assumed to be 5 per cent on the yarn price as the decentralised units are located near the handloom areas. The survey established the cost of

10/ It has been discussed earlier in Chapter-2 that at present the handloom weavers ,in many cases,pay as much as 25-30 per cent above the yarn price. However,it has been assumed that if BHB supplies the yarn directly to the handloom weavers, then they would pay 10 per cent above the ex-mill factory price, when supplied from the modern sector.

the sizing materials at Tk.o83 per lb.of yarn. The yearly build-up of the raw-material costs have been shown in the appendix 6.24, while the table 6.36 below gives the maximum requirement of the raw-material costs which as mentioned remains constant during the project life-time :-

TABLE 6.36

Annual Raw Material Costs of Traditional Technologies
(In Million Taka)

Types of Technologies	Cost of Yarn	Sizing Material Cost	Total Raw-Material Cost
Pit Looms	155.58	4.67	160.25
C.R.Looms	155.58	4.67	160 25

The raw-material cost of both the Pit and the C.R looms is Tk.160.25 million which is higher than the cost required by the modern and the RFC Composite units. This is because the input for the handloom is yarn instead of raw-cotton required by the Composite units, The yarn costs include ex-factory selling price and distribution and transportation costs . Although,yarn is also the input for the Service Centre, but the distribution and the transportation costs for the Service Centre is relatively lower than the handloom . The ex-factory selling price already includes value-added upto the Ring-Finishing stage and also possible surplus. The use of the sizing materials in handloom weaving has been found to be much more than in the modern and the intermediate composite technologies as because their sizing operations are conducted in a very small scale.

Spares Cost (Cost Element - II)

It has been observed during the handloom survey that the spares costs for the Pit and the C.R looms vary. This variation applies to different loom types as well/as within the same kind of , looms and may also depend on the kind of output and the location of the looms. However, the estimates of the spares costs have been based on the average annual consumption of spares and repairs.

It was found to be Tk.180 and Tk.225 for the Pit and the C.R looms respectively, which in terms of percentage of loom price may be expressed as 20 (Pit looms) and 7.5 (C.R looms) per cent. The spares cost would accomodate any spares cost required for the preparatory machinery, however, it has been observed that except for the 'Drum'(for beam making) no other equipment requires any spares. The total cost required for spares have been calculated and given in the table 6.37 below. The spares costs incur from the 5th year as the loom and equipment price is inclusive of one year's spares price.(See appendix 6.24).The spares costs is assumed to remain constant during the life of the project.

TABLE 6.37

Annual Spare Costs of Traditional Technologies
(In Million Taka)

Types of Technologies	Spares Cost (In Taka)
Pit looms	2.47
C.R looms	2.39

The spares cost of the Pit and the C.R looms are Tk.2.49 million and Tk.2.39 million respectively. The Pit loom has about 4.18 per cent higher spares cost requirement than the C.R looms. The spares cost of the traditional technology include fuel and lubrication costs. The handloom technology uses kerosene oil and wax for lubricating the looms.

Labour and Administrative Costs (Cost Element -III)

The wages cost of the traditional handloom technologies have been estimated from the survey mentioned before. The total wage cost could be calculated by using the already established annual wages (See Wages and Salaries) in combination with the number of operatives required to achieve the comparable scale of output(Q). It has been assumed that the traditional sector would not require any adminstrative cost as the handloom weaver would get their yarn from the Handloom Board's Marketing and Distribution

Centre and would return the finished product to the Centre.

The wage cost would depend on the amount of finished product, and would therefore vary according to production build-up from the start-up time till the full production level is reached. The total wages cost for Pit and C.R looms is shown in table 6.38 below :-

TABLE 6.38

Annual Spare Costs of Traditional Technologies
(In Million Taka)

Types of Technologies	Total Wage Cost of Prep.Operative	Total Wage Cost of the Weavers	Total Wage Cost
Pit looms	19.00	50.12	69.13
C.R looms	18.23	20.12	68.36

The total wages cost of the pit and the C.R looms are Tk.69.13 million and Tk.68.36 million respectively. The wage cost of the pit loom is marginally higher i.e about 1.13 per cent. The total wages cost for the weavers are the same for both the looms , as the weaving wages are based on the number of yards woven. However, because of the high level of production of the C.R loom its weavers earn about 30 per cent more than the pit loom weavers.

Other Costs (Cost Element -IV)

The traditional technologies have been to assumed to entail no administrative cost. It is the handloom weavers who will buy the yarn from the Bangladesh Handloom Board Distribution and then sell the finished product (grey cloth) back to the Board. This the weavers can do on the market day. However, to accomodate incidental expenses and repairs of the working shed a fixed amount would be taken for maintenance and miscellaneous costs. This cost has been estimated for the Pit and the C.R looms as Tk.15 and Tk.20 per loom respectively. and would be incurred in the 4th year. It would , however, remain constant over the project-life. The table 6.39shows the total requirement of the 'other costs'by the Pit and the C.R looms :

TABLE 6.39

Annual 'Other' Operating Costs of the Traditional Technologies
(In Thousand Takas)

Types of Technologies	Number of Looms	Cost per Loom	Total Costs
Pit looms	13,824	15	207.36
C.R looms	10,636	20	212.72

The total annual 'other' costs of the Pit and the C.R looms are Tk. 207 and 213 thousand respectively. Compared to the modern and intermediate technologies, these costs are significantly low. Low costs entailed by the traditional sector is due to its very little requirement of overhead costs.

Total Annual Operating Cost of the Traditional Technologies

The total operating cost for the Pit and the C.R loom have been found by combining the cost elements I to IV as established above. The operating cost for the year 5 when it reaches its maximum has been shown in table 6.40. The yearwise build-up of the cost has been given in the appendix 6.24.

TABLE 6.40

Total Annual Operating Costs of the Traditional Technologies
(In Million Taka)

Types of Technologies	Total Operating Costs (In Taka)
Pit looms	232.08
C.R looms	231.21

The toal operating costs of the Pit and the C.R looms are Tk.232.08 million and Tk.231.21 million respectively. The operating costs of the Pit loom is marginally higher i.e only by 0.37 per cent.

The operating costs of the two looms do not vary significantly as the differentials between their cost elements are not prominent. The raw-material costs, for instance, which is about 70 per cent of the total operating costs is identical for both the loom types. The other major costs also do not vary noticeably as the preparatory sub-processes are common for both the looms, and the weaving payments are made on the cloth woven per yard.

Revenue of the Alternative Technologies.

There would be three sources of revenue, from the intermediate output(yarn), the final output (Grey cloth) and finally from the saleable waste cotton. The sources of revenue for the spinnig unit are yarn and waste cotton, while for the composite unit, these are grey fabric and waste cotton. All the modern and the intermediate technologies except the Service Centre would have revenue from the wastages. The Service Centre and the handloom would not have any revenue from waste cotton as their input is intermediate product i.e yarn. As the alternative technologies have different waste levels their revenue from the wastages would vary accordingly. The ex-factory price of yarn and grey fabric have been estimated from the BTMC, for the exact quality of the yarn and the construction of the fabric. The price per lb. of yarn and per sq.yd. of grey cloth is estimated to be Tk.24.78 and Tk.6.50 respectively. As the output level of the grey cloth is taken to be identical for all the technologies, therefore the revenue received from the grey cloth would also be the same. However, the revenue from the yarn would vary, as input to the Service Centre and the handloom technologies are different (see table 5.28). Table 6.41 shows the maximum revenue (at full production level) of the modern , intermediate and traditional technologies (see appendix 6.25) in the 5th year which remain constant over the life of the project.

The revenue of the modern spinning unit is Tk.139.94 million and Tk.141.0million when supplying yarn to the Service Ce tre and the handloom weavers respectively. The difference in the revenue between is significant and is due to the difference in the input requirement. The revenue of the RFC power spinning is identical to the modern spinning as they supply identical quantity of input to the handloom weavers and have the same wastage levels. The revenue of ATDA pedal and the KVIC hand-spinning are Tk.141.0m and Tk.141.23 million reepectively, and again the variation in the revenue is insignificant. The revenue

TABLE 61

REVENUE FROM ALTERNATIVE TECHNOLOGIES
(In Million Taka)

	Modern Technology			Intermediate Technology				Tradition Technology
	SPINNING		COMPOSITE	SPINNING			COMPOSITE	
				Pedal	Power	Hand		
	a/Input to S.Centre	Input to Handloom	Modern Weaving	Input to Handloom	Input to Handloom	Input to Handloom	Pedal/Power Loom	Pit/C.R Loom
Wastage	1.51	1.53	1.48	1.64	1.53	1.76	1.49	-
Intermediate Output								
Yarn(million lbs)	5.59	5.63	-	5.63	5.63	5.63	-	-
Price/lb(Taka)	24.78	24.78	-	24.78	24.78	24.78	-	-
Revenue from Yarn	139.43	139.47	-	139.47	139.47	139.47	-	-
Sub-Total	139.94	141.00	1.48	141.11	141.00	141.00	1.49	-
Final Output								
Grey Cloth(million square yards)	-	-	37.13	-	-	-	37,13	37.13
Price/sq.yd(Taka)			6.50	-	-	-	6.50	6.50
Revenue from Cloth			241.34	-	-	-	241.34	241.34
Sub-Total			241.34	-	-	-	241.34	241.34
TOTAL	139.94	141.oo	242.82	141.11	141.00	141.00	242.83	241.34

Note: a/ S.Centre : Sevice Centre.

of the modern, RFC composite (pedal and power looms) and the handloom (pit and C.R looms) are Tk.242.82m, Tk.242.83m and Tk.241.34 million respectively. The revenue of the modern and the RFC composite units are almost the same, however, the revenue of the handloom is 99.39 per cent of them. This difference is due to the additional revenues receive from the wastage by the modern and RFC composite technologies.